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SHORT SERVICE TRAINING OF RESERVE OFFICERS ON THE GERMAN SYSTEM.

By Mr. C. E. STROMEYER.

Wednesday, 9th December, 1903.

Lieut.-General Lord METHUEN, G.C.B., K.C.V.O., C.M.G., in the Chair.

ON account of the enormous and very sudden expansion of Continental Armies when changing from a peace footing to a war footing it is, with them, necessary to have a reserve of officers which in most countries outnumber the officers of the line in the ratio of five or six to one. During our late war we, too, had to find more officers than had been trained to that profession, and the late Colonel John Davis, when he heard that I was studying the German system of training reserve officers, though this was done only as regards its bearing on industries, asked me to bring the matter before this Institution. I then considered it necessary to inform myself more in detail as to the working of the German system, which, briefly stated, is that deserving young men of education, after passing through the ranks, obtain their commissions. I was fortunate enough to receive a most interesting letter from a commanding officer in the German Army, in which the matter is so fully dealt with that I have made a literal translation of it, and believe that only very few additional words will be needed to show how a modification of the system might be adopted here, and how it would work beneficially both for the Army and for our industries.

Translation.

ONE-YEAR VOLUNTEER SYSTEM OF THE GERMAN ARMY.

"This system grew out of the national rising of Prussia, in 1813, against Napoleonic oppression. At that time, when founding the territorial or second reserve (Landwehr), a call was made for volunteers. Young men of means combined to form special volunteer corps, of which the most celebrated one was that known at Lutzow's Volunteer Corps. Later, in 1814, when universal conscription was regulated by law, it was felt that the wealthy and educated members of the community might be treated more leniently than others, by being relieved of many inconveniences which would arise out of

their military services. For centuries these higher elements of the nation, in so far as they were not serving their country as officers, had been exempt from personal military services, and it was only natural that the compulsion to serve a hard service in the ranks, in company with young men from the lowest classes, was considered such an irksome one as to be almost unbearable. This explains why, in those days, nobody considered it an unfair or unjust favouritism for these young men to receive many ameliorations. Therefore, when the legal period of active service of the larger number of men was fixed at three years, one year was deemed sufficient for others, of a certain grade of education, on the understanding that they would pay for their clothes, provisions, and lodgings. They were in those days also granted the privilege of being trained separately, and the authorities were generally satisfied with their doing relatively less work than others in various branches of military service. It was considered almost natural that they should be relieved of many not actually military tasks, more particularly of fatigue duties, that they should be allowed to live in lodgings, and that a comrade might clean and polish for them. Finally, they were permitted to wear distinctive marks on their uniforms which differentiated them from the large number of soldiers who had to bear all the burdens of military service.

The interference with every young man's civil vocations, which is inevitable on his being drawn into active military service, was felt to be particularly irksome to the upper classes, and they received marked considerations in view of the long time which had to be spent on their civil education, as well as in view of the heavy expense inseparable from long studies. Therefore, during a period which extended far into the second half of the nineteenth century, the Prussian 'one-year volunteer' was not exclusively a soldier, even during the twelve months of his service, but he could occasionally attend to civil matters. As a result he was for a long time not considered to be a valuable addition to his company, squadron, or battery, and his superiors looked on him as being an inferior soldier and a necessary evil.

It took a long time before the masses were permeated by the idea that it is an honour to serve with the colours. This slowness was due, to a large extent, to the fact that Prussia was the only country in which conscription had been made strictly universal, while in other German States, including Hanover and Hessen, which intersect Prussia, as well as in all foreign countries, young men of the well-to-do classes were not compelled to serve in the Army. In former days, anyone who had the means could buy a substitute, and naturally the rank and file were looked down upon.

These conditions have been entirely changed by the introduction into all German States of universal conscription. The law of 9th November, 1867, dealing with military obligations, regulated this matter for North Germany, and after the founding of the German Empire, especially after the law of 1874, there is no longer any difference between North and South Germany. The successes of the German arms in 1864, 1866, 1870-71, have completely changed the feelings of the nation as regards serving with the colours, and these wars have also clearly demonstrated that a large and well-trained corps of first and second reserve officers is absolutely necessary.

The introduction into Germany of universal suffrage has tended more and more to obliterate class distinctions and class privileges,

including those previously accorded to the educated and wealthy, who had served only for short periods and under easy conditions. The military education of the 'one-year volunteer' has everywhere grown to be a thorough one, his former ameliorations and indulgences have disappeared more and more, and he is now really and truly a soldier. The exacting and diverse duties of military service leave him no time for other educational purposes. The young man who, dressed in a soldier's uniform, used to attend lectures at the universities, who gave lessons, who conducted law suits in civil courts, or who made himself useful in his father's business, is a being of the past, is almost a myth. The 'one-year volunteer' is really and truly a soldier, he is not now a thorn in the flesh of the chief of his company or squadron, nor is he a burden to his battalion or battery; on the contrary, he is a most valuable support, and not infrequently, during the last months of his year of service, he shows himself to be even more useful than many a young sergeant.

The load which is nowadays placed on the shoulders of a young man's family is, therefore, materially heavier than it used to be, but the feeling of pride at belonging to the Army, and the very substantial advantage of having to serve only one year instead of two or three, lightens this burden, at least in a relative sense.

From the very commencement of the adoption of universal compulsory conscription, *i.e.*, from the day of the removal of the permission to buy substitutes, a secondary object has been combined with that of training young men to become soldiers, viz., the creation of a corps of officers for the first and second reserve; and ever since the day that there have been 'one-year volunteers' in the Prussian Army, numerous officers have emerged from amongst them. During the first few decades of the past century their military training was decidedly poor, with the result that during manœuvres, and during changes from a peace footing to a war footing, these reserve officers were often undecided and not fully prepared for the demands suddenly made on them; but with prolonged employment during the six weeks' war of 1866, and especially during that of 1870-71, their self-reliance increased rapidly, and most of these officers quickly grew to be not only thoroughly serviceable, but absolutely indispensable. During the second half of the 1870-71 campaign, many corps of officers in German regiments consisted almost exclusively of officers of the 1st and 2nd Reserve. Many companies, not only of the 1st and 2nd Reserve, but of the Line, were led by reserve officers.

In the casualty lists of the Franco-Prussian War could be found the names of numerous officers of the reserves, but the only conveniently accessible detail is, that at the battle of Vionville—Mars-la-Tour the 3rd Westphalian Infantry Regiment No. 16 lost 27 officers killed and 21 wounded, of which respectively 13 and 9 belonged to the reserves.

The whole system ('one-year volunteers' and converting them into reserve officers) has proved itself to be satisfactory; the love which now exists in the German nation for military service (Kriegswesen), the love of bearing arms, has in a comparatively short time converted a host of young clerks, young teachers, manufacturers' and country gentlemen's sons, into very serviceable officers. Even supposing that these reserve officers had proved themselves less efficient than they did, it would now be infinitely more difficult to do without them than formerly. The more universal conscription has become, the larger the masses which may suddenly be called to the colours, the

greater the disproportion between the peace footing and the war footing of the Army, the more inadequate grows the number of the officers of the line, who in this respect may just suffice in time of peace for teaching and training purposes. When, however, an army is mobilised, and its numbers not only doubled but increased five- or six-fold, nothing can be done without a correspondingly large number of reserve officers. They are mostly employed as lieutenants, but a not inconsiderable number act as first lieutenants and captains, and take charge of companies and squadrons.

On account of the ever-increasing importance of the reserve officers, it has been found necessary to make the very fullest educational use of their short (one year) military service, and to thoroughly utilise the manœuvres, generally eight weeks, which precede the commissioning of a 'one-year volunteer.' Great importance is also attached to his returning three times to the colours for renewed manœuvre trainings of from four to eight weeks.

It can now safely be said that the officers of the 1st and 2nd Reserve stand on a higher footing as regards military training, experience, and self-reliance than they did during the past wars.

Reprints of the laws and regulations dealing with the above-mentioned subjects are to be found in *Vorschriften der Wehr- und Heerordnung* (Mittler & Sohn, Berlin)."

Briefly summarised, this letter says that German reserve officers have given entire satisfaction in the late wars, and now that the whole nation is proud of its Army, the training of such one-year conscripts as are fit to be transferred to the reserve as officers is as thorough as can be desired.

The German service conditions are as follows: Young men who have passed a standard of education, equal to our matriculation examinations, are allowed to serve in the Army for the reduced term of one year only, instead of for three years, provided that they pay for their own clothes, lodgings, subsistence, mounts, and for the wear and tear of their arms. They are accorded the privilege of presenting themselves for examination as officers of the reserves, provided they are properly qualified as regards means, social position, and character, points on which the reserve officers of territorial districts decide by vote.

With reference to this point, the writer of the above letter remarks:—"The election is carried out by an assembly of reserve officers of the candidate's district. The assembly has as president a commanding officer of the staff, and represents all arms. For instance, I am president of an assembly of 260 reserve officers, amongst whom I can count fifty to sixty different uniforms, including ten of the Guards, and I find that this assembly consists of many judges and lawyers, factory owners and managers, engineers, bankers, merchants, Customs and Post Office officials, professors, architects, chemists, railway officials, and agriculturists. This assembly meets once a month for military communications, lasts from half an hour to one hour, and then resolves itself into a social gathering."

The literal rendering of the term "Einjährig Freiwilliger" is "one-year volunteer," as used in the above translation, but seeing that the German military service is compulsory, a more correct name is "one-year conscripts." It is important to bear in mind that German reserve officers are drawn from this class of conscripts. If in

England real, and not merely nominal, "short-service volunteers" could be drawn into the Army, this would indicate that they possess a liking for the profession, which would increase the possibility of converting them into even more efficient reserve officers than in Germany.

A German artillery officer, who for two years acted as instructor to those reserve officers of his branch of the Service who wished to remain in the Army and attain higher ranks, informed me that the best reserve officers are those who, like works managers, have to handle men, and at the same time attend to business, whereas the most unsuitable men, on account of their slowness, prolixity, and indecision, are lawyers and teachers. Amongst managers of works he has often found men who would certainly have risen to distinction if they had joined the corps of regular officers, and that, even with their limited military training, they were quite as efficient as the others.

Our late war demonstrated that we have many Volunteers, but no large reserve of officers, and two successive Secretaries of State for War have repeatedly drawn attention to this shortcoming. They asked for officers for the Reserves and for the Volunteers, but no inducements are offered to any except those comparatively few who have the inclination and necessary means (and who, of course, become Regular officers) to submit to the military training which will make them useful in time of war. Many young men would take as much pride in knowing their drill as do the average Germans, but as a strictly military training would unfit them for their fathers' businesses, or for pursuing other civil vocations, these would-be soldiers have reluctantly to devote their attention exclusively to civil matters, and in time become lawyers, doctors, merchants, engineers, etc. Yet it would do them no harm but much good if, after leaving school or college, which are artificial little universes, they were to acquire some insight into the inexorable realities of life in the greater universe into which they are entering by being subjected to military discipline. Under present Army regulations this is almost impossible.

A young man fresh from college, and waiting for an opening, may, if he likes, join the Army and may leave it before the expiration of three years by paying a heavy fine. He would have to live in barracks, with vulgar company, and would have to feed on coarse food. On returning to civil life he would be laughed at, either because of his three years' waste of time or, if he left earlier, for not having been able to bear his self-selected hardships; besides he would find himself at a disadvantage as compared with his schoolmates, who would then have found suitable berths.

This condition of things could easily be altered if the Army were made attractive to young men of means, if they were granted permission to volunteer for short services of twelve months, if they could live in lodgings, and if they might hope to become officers in the Reserve. Seeing that they would be valuable acquisitions in time of war, it would seem reasonable to reward them at the end of their term by a sum sufficiently large to cover past military expenses. This might take the form of scholarships after successfully passing examinations as officers. Another concession which such "short-service volunteers" would doubtless appreciate would be the option of leaving the Army before the expiration of twelve months, so as not to miss lucrative employments which might be offered them. In that case, of course, they need receive no compensation.

If with us "short-service volunteers" could be drawn into the Army, they would *as soon as possible* have to be informed whether they may expect to be elected if they pass their examinations.

In spite of the above suggested inducements to candidates for commissions in the Reserves, it is possible that their numbers might be relatively small. I would therefore point out to parents what are the very material personal advantages to be derived from a short service in the Army.

In Germany there are practically no public schools. All classes, the high and the low, the rich and the poor, learn the same lessons on the same forms, so that without any special instructions, boys, who may later become leaders of men, acquire an early knowledge of the working classes. This insight into character is enlarged during the twelve months' compulsory service in the ranks, and the art of leading men is drilled into the "one-year conscripts" when qualifying for their commissions. As a result, these young men if technically trained are in Germany at once fit to occupy responsible positions as sub-managers of works and in other undertakings.

In England, a young man from college who may find employment in some industrial works is carefully locked away in the drawing office or the laboratory, and possibly reprimanded if he talks to workmen, even the head managers and senior partners rarely deal with the men direct, because experience has taught them that the handling of men is best done by those who know them, *i.e.*, by the foremen. Naturally the masters have no power to lead their men, as has been proved over and over again in the case of English strikes.

There is no reason to suggest that the English educated classes are worse leaders of men than are the classes from which our foremen are drawn, and if young men, fresh from school or college, were given a chance, though only a late one, of associating with the working classes on a level, *i.e.*, under military discipline, the advantages would soon be found to be so great that many parents would wish their sons to join the Army for a time as "short-service volunteers," even if for no other object than to give them some idea of the handling of men; a branch of knowledge which is most rigorously excluded from all our public schools and colleges.

The CHAIRMAN (Lieut.-General Lord Methuen, G.C.B., &c.):—I do earnestly ask you to have a good discussion on this paper. It is an extremely short one, and only just touches on the fringe of the subject, and simply lends itself to discussion. What it is about the Institution I cannot tell you, but certainly in the olden days, whether we were nearer our antagonists or not, I do not know, or whether it is that the Chairman is highly placed as I am now, with a very large number of reporters below me—certainly in the olden days in our small building, we used to have far stronger discussions than we generally have now in this present building of ours. Therefore I hope that those who are present—I see a great number whose opinions we all much value—will be good enough to speak out.

Colonel Lord RAGLAN (Royal Monmouthshire Royal Engineers Militia):—The Chairman has called upon me to make a speech, and by doing so has placed me at a great disadvantage, because, unfortunately, not having had time to read the lecture beforehand, I am not prepared with any speech on the subject. We all know that the question of providing an adequate number of reserve officers is one of the

most serious we can imagine. I think I can flatter myself to this extent: that it was on the platform of this Institution that I, as far as I know, was the first to draw attention in public to the fact that by the introduction of short service we very largely increase the numbers of men available for war; while at the same time we do actually reduce the number of officers serving, and had had no provision, or practically no provision, made whatever for the establishment of a Reserve. The whole difficulty of establishing a proper Reserve of officers in this country is very great. The position differs entirely from that in Germany, for this reason: that practically in Germany you have only one Army, but here in this country we have a great many Armies. We have the Regular Army, the Militia, the Yeomanry, and the Volunteers. The practical difficulties of the case are these: that whatever arrangements you make for the benefit of the one Service are very apt to act to the detriment of the other Services. For instance, the system sketched out in the lecture of appointing to the Army young men on the one-year volunteer German system, would deprive the Auxiliary forces of the services of those young men, many of whom might take up commissions in the Militia, the Yeomanry, or the Volunteers. In this country we are practically limited in our present Army Reserve to those officers who have retired from the Regular Army, and the result of that is that the only classes of officers which are provided are the classes which you do not want in case of mobilisation. The class you want in case of mobilisation are subalterns, possibly captains, and what you get in the case of mobilisation are elderly captains, and still more elderly field officers. That something should be done in connection with this question I think we are all agreed; but the point to which I have drawn attention, that any large addition to our reserve of subalterns in the Army would deprive the Militia and Volunteers of those very officers, I think must make one pause. I am afraid that I have no remedy to suggest for that reason. The matter is one that has come under my personal knowledge perhaps more than most people's; and the other difficulty—of offering sufficient inducement to make men join a Reserve for the Army, and at the same time thereby taking them out of the Auxiliary forces—is a difficulty that I myself do not see exactly how to get over.

General Sir George Higginson, G.C.B. (Colonel of the Worcestershire Regiment): — Like Lord Raglan, I came into the room quite unacquainted with the subject of this most interesting lecture; but it naturally has set one thinking upon the different remedies which have been proposed from time to time when a great dearth of officers on a great emergency has arisen. Although it sounds presumptuous to give an opinion upon a paper so carefully prepared, and founded on such excellent data, at the same time I go back to what I have always attempted to advocate, which is, that unless the great public schools set the example of showing that early military education is quite as honourable a mode of obtaining distinction as that usually enforced at public schools and universities, you will never obtain a body of educated young men who can be called upon, not with perfect knowledge of their profession, but with sufficient elementary—and I will go further and say sufficient practical—knowledge to be able, with a very little perseverance and good will, to be fit to command. It will be noticed that the lecture is founded upon the German system of conscription, where every man, no matter whether he is gentle or the reverse, has to serve in the ranks. Whether it is the one-year man—profiting by the indulgence granted to the educated classes—or whether it is the three-year man in the ranks, those ranks represent the

whole community. Our ranks cannot possibly be considered to do so. We are composed—I say it advisedly, and with nothing offensive in the tone—of the lower classes of the community, officered by the higher classes. The middle, the back and sinew of the nation, are not necessarily represented, and until the country admits—which I do not think it is at present the least prepared to admit—that universal service is necessary, you must put up with what you find of the material which the great public schools afford for officers, and with what the agricultural and the lower class of mechanics afford for private soldiers. I do not see how any training of foremen of works, though it certainly enables them to be considered leaders of men, would justify their being placed, simply for that reason, above the heads of officers who have made the profession their object through life. We have seen during the late war—nobody knows it better than Lord Methuen—how retired officers, who have placed their names on the Reserve list, have been called upon suddenly to quit occupations, and many of them to quit the management of great estates and other very important avocations, to return to duty in the same rank which they held when they left; and I have seen in the ranks—it must be known to many of us—men serving as lieutenants eight and nine years senior, not only in point of actual age, but from the dates of their first commissions, to those with whom they were compelled to serve as inferior officers. The subject is so broad that it is impossible on an occasion like this to treat it in detail; but I think until the great public schools can be brought to understand that there, amongst them, lies the material for the Army, whether it is young officers in the ranks of the Regular Army or subsequently in the ranks of the Militia and the Yeomanry—amongst them lies the necessity of treating the military profession as one which is just as important for a great nation like ours as proficiency in science and classics. I can only apologise for saying so much without due preparation, but you have invited young and old to speak. You have heard the experience of Lord Raglan while the head of the Militia at the War Office. He sees no solution at the present moment, nor can I, except an appeal to the universities and the great public schools to take up the question of the military profession as being the most honourable they can advocate.

General Sir A. Power Palmer, G.C.B., G.C.I.E. (Indian Army): — I have given this subject considerable thought. When I was Commander-in-Chief in India we felt that a Reserve of officers was the great want, as we quite realised that if a great war took place we might have to embody large numbers of native troops, and the question of officering them would be most important. We went into all sorts of schemes, with the idea of providing incentives, so that we could draw out the classes which were most desirable to officer any irregulars that we might put in the field. I think the whole thing rather turns on incentives. If I had been called on to speak earlier I should have advocated what has just been said, that our public schools and universities are the chief sources from which we must hope successfully to draw our raw material. It is very nice to appeal to the honourable feeling of our countrymen and of our young fellows, but generally some incentive is required, and if we could devise something which would draw them and induce them to help us in coming forward—either remission of taxation when they enter public life, or some decoration or something that people prize in the way of honours and rewards, some might come forward and enrol themselves. In these matter-of-fact days we may appeal a good deal to honour and glory, and certainly when a difficulty

arises men come forward splendidly, *but they often have no previous training*. If they had some incentive to enrol themselves for a period, putting in a certain time with our Regular troops, learning the business of war, and getting a little up-to-date, I think it would be extremely advisable. Nowadays, we have to learn a little more than when I entered the Service. If anybody here could suggest anything that would induce those young men to enrol themselves, and take the trouble to put in, say, a year's training, and then every year afterwards to attend manœuvres, or the training of some regular bodies of troops in various districts, I think one step would be taken towards the very desirable object we have in view.[1]

Mr. Ernest A. CALVERT :—Although I have not had any experience of military subjects, still, this question interests me, because the Service man—I do not know whether I am calling him the right name—plays a very important part in regard to getting on in life. I do not want to mention to you many personal matters, but, still, my experience through life throws a great deal of light on the subject. I received a copy of the paper from the author—I am sorry I did not receive it before—and on reading it it appears to me that it is a general idea amongst the community at large that the only man who can be head of a works, or head of any firm, or occupy any position whatever beyond that of slavery and drudgery, must be a Service man. Now, I wish to maintain—with all due respect to both branches of His Majesty's Service, in which I have many relations, and for which I have the very highest respect—I wish to maintain that there are civilians who can command as well, if not still better, than Service men, and the proof of the pudding is in the eating. They tried the Service man for the police, and he did not do. They tried a civilian, and he did do. They tried a Service man for the fire brigade, and he did not do. Therefore I say I disagree with the suggestion made, and I consider it rather an insult to ask anyone to attend a meeting which is held practically to prove that nobody but Service men are capable of being in a managing position. I should not have liked it if it had been said by anybody but the author, because I am a member of the same institution as he is. That is my first point. The next point I wish to turn to, without bringing too much of my experience in, is that I would like to state that I am an engineer, aged 37. I am told that I am too old for the drawing office, although I have had nine years' experience, and have the highest testimonials. I cannot go into the shops, because the trades union say that no man who has been trained as a master engineer can serve in the shops, although I served my time in seven shops connected with mechanical engineering. I am told that the only thing open to me is a public appointment. I tried for a public appointment. What is the answer I get? "Oh, you are not a Service man." That is where it hits—you cannot have it because you are not a

[1] I understand that in the late war there was a great drain on regimental officers for the command of posts on the lines of communication, and for various departmental billets, a drain which is always deplorable in the interests of the fighting lines, and which might surely have been obviated by the employment of unemployed officers of the Indian Army, of whom numbers pass annually to the Unemployed Supernumerary List, while still full of work. I believe that a fee of thirty shillings is at present demanded from those who desire to enrol themselves as Reserve officers! Surely, rather something in the way of a retaining fee, such as paying a penny less in the pound income-tax than non-reservists, would be a more desirable arrangement.—A. P. P.

Service man. I gave ten years of my life as a volunteer to the London Fire Brigade, while still carrying on my trade professionally in this metropolis. The appointment of second officer became vacant. I was too young for it; the appointment for third officer became vacant. They advertised for a mechanic who had seen fire experience, and they put in the advertisement: "No other applicants but those who have had fire experience and business relations connected with mechanics will be considered." Well, they went and appointed a young naval man, a Service man, who was cutting his teeth when I had made my name as a fireman. I do not mix in politics, so that it was from no party political views that I consider that the abilities and position of the Service man were overrated; and that to show I do not mix in politics, I have got support from members of both sides of the House of Commons, etc., when applying for public positions. I do not want to be like the bear with a sore head, and I do not want to speak against the Service too strongly, but that shows the kind of treatment that is meted out to you, and for that reason I think there is a very strong point in favour of some movement such as the author of this paper proposes. If we look round at the various Government Departments, I will tell you what you will see, because I have been round after work—we see that nearly every mechanical engineering appointment——

The CHAIRMAN:—I am very sorry to interrupt you, but I think you must keep to the point. The question is, "Short Service Training of Reserve Officers on the German System," and I think you are getting a little beyond it.

Mr. CALVERT:—I only wanted to point out, Sir, that it is absolutely necessary that civilians should have a chance of being able to compete, to earn their daily bread, against the Service man. I am very willing to give the Service man the tip-top position, but, at the same time, I think it is absolutely necessary that some system such as the author proposes should be considered by His Majesty's Government. One gentleman just now referred to the public schools. I should like to mention that when I was at a well-known school we had punishment drill instead of lines, and we had a regular system by which we "got up" all the military drills. I think if such a system were instituted in our public schools, instead of the other systems of punishment, the civilians turned out would be of more use if they were called upon in a case of emergency, such as the C.I.V.'s were. Lastly, I want to say that I think there ought to be some system of giving poor men a better chance of joining the existing Auxiliary forces, such as the Volunteers and the Militia. There are very many men I know in engineering firms who would be only too delighted to join a Militia regiment, but they cannot afford the expense with their limited incomes. Therefore I think that if some means were provided by which that system could be adopted, we should get a larger number enrolled in the Auxiliary forces. I hope in the remarks I have made I have not shown any want of courtesy to the Services.

Mr. DREWITT HALPEN:—I am interested in this question from two or three points of view, and should like to say one or two words on the lecture. On page 122 of the paper, the German home service is referred to as being for three years. I do not know whether that is a clerical error, but having a knowledge of the matter I believe that within the last three or four years it has been reduced to two.

The CHAIRMAN:—You are quite correct; it is two now. The three has been changed.

Mr. DREWITT HALPEN :—There is one other point I should like to allude to. I have heard it said by a very eminent English professor at a discussion before a technical institution in regard to this question, that simply to pass a capability examination gives people the right to this one year's service. Theoretically it does, but practically in hundreds and thousands of cases the right is of no earthly use, because, at the present day, it is such a very expensive thing that many who have the absolute right have not the means to carry it out; and this particular gentleman connected with education put it down as an absolute fact that that was so. The only other remark I have to make is from the industrial point of view. I have known Germany intimately for forty or fifty years, having been brought up there, and I am perfectly well aware of the great national burden this service is, and the great slice that is involuntarily taken out of a man's life while he is in the ranks. But I certainly think it is richly paid for afterwards, because the measure of obedience, discipline, and orderliness, and certain other good things which they obtain by that training, are well worth the time that is taken. Though I am not here to say that I would be willing to see conscription in this country, I certainly think it will not have, from a certain point of view, very great disadvantages in industrial life, because I am convinced that many of the troubles that arise in the workshops and manufactories with which I am connected do not arise in Germany. There is a great deal of bad feeling there, but that is mere Socialism; a great many of our shop troubles do not arise there because the people from their youth up have been trained to handle men in a way in which they very seldom have the opportunity of doing here in England.

Mr. STROMEYER, in reply, said :—With the exception of the translation of the officer's letter, my paper deals as little as possible with the military side of the question, because I confess I do not fully understand several military difficulties. I had, in fact, approached the subject from the point of view of giving the young managers of works a better chance of handling their men than they have now. One notices, particularly in the Lancashire districts, that people who have grown rich on industries naturally send their boys to the very best public schools which they can find. A boy comes back, gets put into the works, is made head of some department, and matters progress satisfactorily; most likely because the works are managed for him by his father. The father dies. The young man has probably inherited the gift which made his father rise in his particular profession, but the schooling which he has obtained has unfitted him for managing the concern in such a manner that it will be as profitable as it used to be. When the father dies, the guiding spirit disappears; the son finds the business is not as good as it used to be, he changes it into a limited company, and disappears out of a profession for which, probably, he was as gifted as his father. I think it is the very long schooling at public schools, and subsequently at the universities, which is doing this harm. I do not at all wish to speak against a thoroughly good education, but public schools have this disadvantage to industrials that the boys mix only with gentlemen like themselves. In the colleges it is the same, and they never really come in contact with the workmen as the father has done. Two or three generations ago, the ancestors of these young men may have been real working men who had gradually raised themselves, and were thus quite in touch with the workmen; but their sons are sent to schools where, as the parents say, they make gentlemen of them. When they come back they are not in touch with the workmen. That was the

point from which I started. Another point which forced itself upon me was the frequent complaint by Secretaries of State for War about the scarcity of Reserve officers and Volunteer officers, and I was in hopes that, in the same way as two negatives make a positive, two troubles might be turned to good account, so to lead to a double advantage. I do not think it is good for the country that all this engineering talent and industrial talent should, as soon as it grows rich, leave the business. I also think it is very desirable that there should be more Reserve officers, and I think that if we increase their number, as proposed, good will be done to our industries. I gather that the greatest demand for officers will always be for the subordinate ones, those who would have to receive superior commands, and transmit them to the rank and file. I believe this is the duty of lieutenants. I do not think the system which I advocate would in any way interfere, as has been suggested, with the supply of officers for the Militia and Volunteers. It was my hope that this very system would add to the number of available officers. For instance, if a young lad serves in the Army and obtains his commission in the Reserve, then there is no reason why he should not join a Volunteer corps and become an officer there. In time of war many of these officers of the Reserve or Volunteers would of course be available for service with the Regular Army. A remark was made that these officers would be promoted more rapidly than those who make the Army a profession. I do not think that is the case in Germany, and should not be the case here. I think they advance at about equal rates. One gentleman suggested that some inducement should be held out to young men to join the Army in the way I have proposed. I think one of the chief inducements which could be held out is the obtaining of a real officer's commission. I believe, as a special inducement to Volunteers, their commissions are signed by the Sovereign. I do not see why, if short service Volunteers get really good military training, the commissions which they may hope for in the Reserves should not be on a level, as it were, with the Army commissions. They would prefer those commissions to Volunteer commissions, and they could, of course, hold both. I believe that would act as a very great attraction. One gentleman mentioned that there is a great distinction between Service men and civilians. I really do not see that there is, or that there should be. A man in Germany who has gone through the Army just for a short time, as long as he is in his work and manages his men, is a civilian, and in time of war he is an officer. I do not see that one need draw any sharp distinction between the two; they seem to me to be equal. As regards expenses, I may mention that, in the German Army, so I understand, the matter is worked in this way. Certain branches of the Army are naturally very popular—the Cavalry, and, I believe, the Artillery too. I think the Infantry and the Pioneers are the branches which well-to-do men object to, therefore special inducements are held out to them, and the other branches are made more expensive. I believe at present any young man wishing to join the Cavalry would have to provide himself with an extra horse, which is, of course, a heavy expense; the expenses for Pioneers or Infantry Volunteers are, I believe, very slight indeed. I think the expenses in the Artillery are also fairly heavy. At any rate, the Government regulates this matter in such a way as to get the right number of men into the various branches.

The CHAIRMAN (Lieut.-General Lord Methuen, G.C.B., K.C.V.O., C.M.G.): — The only criticism I have to make regarding the lecture is its brevity. It is essentially a lecture that has been given from a civilian point of view; it is a lecture that has invited discussion, and I thank those who have taken part in it. As far as the

Reserve of officers is concerned, and the late war, we must always recollect that it is very seldom this country will be called upon to face a war of such very great length, where the number of troops called out was so very large, and where we had such an extent of lines of communication. Therefore, I think we may fairly conclude that the enormous strain that was made on us as regards the Reserve of officers is not likely to occur to the same extent again. I think, as far as I can gather from the lecturer, he has throughout his remarks thought of the regimental officer, and not of the staff officer. Now, any who were out in Africa, or who have read the evidence given before the Commission, will have noted that our extreme difficulty is as regards the want of staff officers, not so much, although also to a certain extent, the want of regimental officers. Whether the plan which was proposed some years ago, and I think is still talked of by Volunteer officers, of having a Volunteer staff corps, is feasible or not I will not enter into, but let us bear in mind that our great difficulty in the last war, and probably in any future war, will be the enormous strain that we have on our staff officers, so long as our present Staff College is limited to the number of officers who go through it. Now, gentlemen, I am treading upon thin ice in the few remarks I am going to make, and if the ice cracks I shall have to ask for your help with the rope to get me out of it. I am going to speak perfectly straight, and I am speaking as one who will shortly be giving evidence before the Commission that is sitting on the Militia and Volunteers. Therefore, I am speaking, having thought over what I am going to say, and feeling perfectly clear that my remarks may not give satisfaction to all. I have, whenever I have spoken in public, endeavoured to induce those who are listening to me to recognise the extraordinary value to this country of encouraging the Church Lads' Brigade, the Cadet Companies' Brigade, and everything that can induce our lads in England to recognise what patriotism is before they become men at the age of twenty, when it is far more difficult to enlist their sympathies. I have said to them this: that I do not believe this country will accept conscription, but I also say this quite clearly, that our difficulties will cease, and that the difficulty we are called upon by the lecturer to face will cease, if this country is at any time prepared to accept that law which is in abeyance from year to year, that is, the Militia ballot. If you accept the Militia ballot, and you meet the leakage of those gentlemen who cannot serve their time in the Militia force by allowing them to go into the Volunteer force, and you take care that that Volunteer force does sufficient duty to make itself thoroughly efficient, then I contend that you re-establish the Militia force in that position which it held formerly; and we shall no more find the Militia forty thousand men short, as we do now, and you will render the Volunteer force efficient and strong, and not sixty thousand or ninety thousand short, as it is at present. But I have always concluded my remarks by saying that, so long as the country cannot face the difficulty of what we, as military men, know to be right for the country, and which it is our duty as military men to educate the country to understand is required—so long as the country cannot face that irksomeness, and cannot show that feeling of patriotism and commonsense that is required, so long must we soldiers endeavour to do our best with what we have placed in our hands. Now, gentlemen, I do not think I need make any further remarks. The ice is now cracking all round me, and I call for the rope which I asked you for. My last duty—and it is an exceedingly pleasant one—is to thank the lecturer extremely for the remarks he has made, and also to thank those gentlemen who have taken part in the discussion for the way in which they have helped us.

SOME REMARKS ON SCREW PROPULSION FOR WAR-SHIPS.

By Fleet Engineer G. QUICK, R.N., Retired.

Wednesday, 25th November, 1903.

Admiral the Hon. Sir E. R. FREMANTLE, G.C.B., C.M.G., Rear-Admiral of the United Kingdom, in the Chair.

IN coming here to say a few words about screw propulsion, I am quite aware that I am touching upon a very well-worn subject, for, as a recent editorial article in one of the principal engineering journals stated:—"It is almost impossible to find something to say about screw propulsion that has not been said before." There are a dozen points which I shall not touch upon, because it is not my intention to attempt to lay before you a general theory of screw propeller action or of screw propeller design, as such a theory, or speculations thereon, would have very little value for naval officers, who have to consider the practical value of the propeller as a weapon of war for use at sea. I believe I am justified in describing the screw as a weapon of war, considering its importance in ramming, of which we have had some painful experience in the cases of the "Iron Duke" and "Vanguard," the "Victoria," and more recently the "Prince George." The power of the screw to give a knot extra speed ahead or astern at a critical period may be of vast importance for saving a ship, or winning a battle, and it is to that point I desire to call your attention to-day. The usual objection made to any proposed improvements in propellers is this:—That if any improvement in their general design were at all possible it would have been effected long ago by the numerous able men who have taken the subject in hand during the last fifty years, and that any attempt at improvement in general design to give higher maximum speed and greater economy is indicative of the ignorance of the proposer and is foredoomed to failure. I am not a believer in finality in practical engineering, in chemistry electricity, and I see no reason whatever why we should consider we have arrived at finality in regard to screw propeller design.

Now the maximum speed of the four great cruisers of the "Drake" class was just over 23 knots with their original propellers. Without doubt the various makers of those propellers considered they were the very best propellers that could be designed for those vessels, and as those vessels attained something over the speed for which they were designed, the results appeared quite satisfactory. But the Admiralty very wisely ordered new blades of 30 per cent. greater area to be made for the "Drake," with the result that the

high speed of 24·11 knots was attained with practically the same I.H.P. as had been required for 23·05 knots. If the original screws had been retained, they would have required 41,000-I.H.P. to drive the ship at the speed of 24·11 knots. Please to consider the increase in weight and space, and cost of the boilers and engines of 30 per cent. greater power than the present boilers and engines, and also the increased consumption of fuel to provide that increased power. You would easily see that it would be almost impossible to cram such powerful engines and boilers into those ships, unless the store-rooms and magazines were abolished, and the ship converted into a mere steaming machine.

The enormous value of the Admiralty improvement of the "Drake's" screws must be apparent to all. But this improvement having been effected, the question arises: Is it possible to make a further improvement in the propellers of those ships so as to drive them at still higher speeds with the same horse-power? Experiments alone on one of those vessels can show exactly how much the maximum speed of those ships can be increased, but I venture to say that by some considerable changes in the present form of the screw propellers there is every probability of an increase of speed of at least one knot being attained with the same maximum horse-power—or, in other words, that the speed of the "Drake" class can be increased to 25 knots with the present boilers and engines, and with practically the same coal consumption as at present. To effect this, the proposed new screws would have to be more efficient than the large screws of the "Drake" to the extent of 4,800-I.H.P. And as the large screws of the "Drake" gave a speed equivalent to an increase of 10,500-I.H.P. over the original small screws, I do not consider that 25 knots is an extravagant estimate for the speed of the "Drake" with propellers still further improved in design.

I will now proceed with the paper, the original of which I forwarded to the Admiralty in the early part of this year.

On entering the Royal Navy as an Assistant Engineer, I had the good fortune to be appointed for two years to H.M. gun-boat "Bullfinch," at Portsmouth Dockyard, which for some years was used principally for trying propellers proposed by many inventors, including those of Griffiths, Hirsch, and Révy. At the same period experiments were being made with Griffiths' propellers on board H.M.S. "Cygnet" and other most important trials were made with ordinary screws having two, three, four, and six blades, on H.M.S. "Shannon," of 3,800 tons, and 2,000-I.H.P., and with the French Mangin screw, also at Portsmouth. I examined the results of those trials, as I had done those of the earlier English and foreign screw ships, from the "Rattler" upwards, and during my subsequent service at sea I have paid attention to the problem of the screw in its relation to the fighting efficiency of the Navy, and the speed and economy of our great merchant steamers. In commerce we must expect to find that vessels making regular voyages will encounter head winds for about one-third of their steaming time; and that propeller will be the best and most economical which will give the best results uniformly when steaming against head winds and seas as well as when steaming in fair weather. My attention was specially attracted to this subject in 1863-64, when H.M.S. "Race-horse" and a French ship of similar size and power were frequently

running between Yokohama and Shanghai. In fine weather the "Racehorse" made rather the better passages, but in rough weather and head winds the French ship showed a decided superiority. The only reason that could be found for the superior performance of the French ship was that she had a screw propeller of much larger area than that of the "Racehorse."

Steaming against head winds is one of those points which is of the highest interest to sea-going people, but it is one that cannot be definitely settled by the results of trial trips or by experiments on models only.

Discussions on screw propellers have been comparatively fruitless during the past forty years, and hope of further improvement appears to have been abandoned by naval architects and marine engineers in consequence of the failure of the numerous new propellers, which have been tried, to increase either the maximum speed of the ship or to achieve any economy of power and fuel at moderate speeds.

If my views were not different from those generally accepted in the text-books I should have no valid reason for bringing them before your notice, and for asking you to criticise them and, if possible, to discredit them, not by reference to trials of models, but by reference to the results obtained from large ships at sea. I need only remind you of the striking success which has attended the endeavours made to increase the speed of the Whitehead torpedo, which had a speed of 8 knots thirty-three years ago, but which can now go 35 knots, and that a corresponding improvement has not been effected in steam-ship propulsion. I ascribe this to the following causes:—

Since the admirable experiments of the late Mr. W. Froude on H.M.S. "Greyhound," we have had no further towing experiments on a large scale to ascertain the actual resistance of ships of modern design at high speed, and in deep water. The only other towing experiment of recent years was that of Mr. Yarrow on a torpedo-boat at 15 knots speed. The speed of the torpedoes has been developed from experiments made with torpedoes of full size, not from model experiments at low speeds.

I do not admit that the tank experiments which are being made in this country and abroad have the same value as experiments made on full-sized ships in deep water. Tank experiments on models indicate the direction in which investigations should be made, but they are not to be relied on in all cases for the formation of hard and fast rules for the design of all classes of propellers. The most valuable contribution which has been made of late years to the solution of the resistance of ships is the discovery of the influence of the depth of water on the resistance and speed of ships. The cases of H.M.S. "Blenheim" and of the U.S. ship "New York," are worthy of note. So also is that described by Capt. Rasmussen, Engineer-in-chief of the Danish Navy, published in the *Transactions* of the Institute of Naval Architects for 1899. That paper shows clearly how much the depth of water affects the apparent resistance of the vessel at different propelling powers.

Another cause of stagnation in the science of propulsion is that it has become customary for the resistance of ships at the highest speeds to be calculated from the G.I.H.P. at those high speeds; and

hence it has been concluded that the resistance of the ship increases with enormous rapidity when the limiting speed is exceeded, so that at 12 per cent. above that limiting speed the I.H.P. required is varying as the seventh power of that speed. This point is admirably brought out in a valuable paper by Mr. Tennyson d'Eyncourt, on "The Limits of Economical Speed of Ships," published in the *Transactions* of the I.N.A. for 1901; and by Mr. James Hamilton in his paper on "Horse-Power absorbed by Skin-Friction and Wave-Making, etc.," published in the *Transactions* of the I.N.A. for 1898.

I am compelled, however, to differ somewhat from the conclusions arrived at by those gentlemen. I admit that the resistance of the ship and the power required to overcome that resistance do rise rapidly after the limiting speed has been reached, but I ascribe a large part of the excess of I.H.P. required to obtain those high speeds to be due to the increased waste of power by the screw propellers at the higher speeds—and this point I shall endeavour to show clearly later on. But the British and foreign shipbuilding authorities are opposed to this view of the matter, for Mr. Hamilton says in his paper:—"There is good reason for believing that the percentages of the total indicated horse-power representing propeller waste and load friction are less in high-powered vessels than in low-powered." That is quite true when the I.H.P. per square foot of helicoidal surface of the screw does not exceed certain limits, but it is impossible for me to find any evidence that the propeller losses do not increase more rapidly than the resistance of the ship when those certain limits of I.H.P. to helicoidal surface are exceeded. Yet it is generally assumed that the propeller losses do not amount at the highest speeds to more than 31 per cent. of the G.I.H.P. or 51 per cent. of the net propelling power. Now Mr. D. W. Taylor in "Resistance and Screw Propulsion," page 27, has shown that for a ship 300 feet long at 20 knots, the resistance of one square foot moving normal to its own direction is about 1,848 lbs., or 770 times as great as that of the same area exposed to tangential or skin-resistance only. What then must be the resistance, the wave-making resistance, of the propeller blades at circumferential and helical speeds from 40 to 67 knots per hour?

This is a matter not for logic, or dispute, but to be settled only by direct experiment on a full sized ship with engines and propellers working at the highest speed. The recent trials of H.M.S. "Drake," and the other large cruisers, "King Alfred," "Good Hope," and "Leviathan," so far as their results have been published, have given me a little opportunity for trying to investigate:—

1. The resistance of those ships at various speeds.
2. The expenditure of the engine power at the various speeds.
3. The irreducible non-productive expenditure of power.
4. The reducible non-productive expenditure of power.

These investigations are far from being as complete as I should like to make them, but I submit them in their rough and unsophisticated condition in the hope that the discussion on them may lead to higher speeds being attained than have been hitherto regarded as possible. For the formulæ and calculations submitted there is no claim made that they possess the accuracy of pure mathematics; or that they are correct rules for all classes of vessels—but I trust that they will merit consideration by those who are interested in increasing the size, the speed and the economy of our ships of war and commerce.

Maximum Speed of Minimum Resistance.

Taking the results of the towing trials of H.M.S. "Greyhound" as a basis of calculation, we have:—

L_1 = length = 172′

C_1 = coefficient of fineness = ·575.

S_1 = speed before resistance increased more than as S_1^2=8 knots.

For the new cruisers of the "Drake" class I assume:—

L_2 = 500′

C_2 = ·525

S_2 = speed to be ascertained before the resistance increases more rapidly than S_2^2.

Then—

$$S_2 = \frac{L_2^{0·83} \times C_1 \times S_1}{L_1^{0·83} \times C_2}$$

$$S_2 = \frac{500^{0·83} \times ·575 \times \text{knots}}{172^{0·83} \times ·552}$$

$$S_2 = 21·0 \text{ knots.}$$

That indicates that the speed of the "Drake" would be 21 knots before the resistance would begin to increase faster than as S_2^2. My analysis of the results of the "Drake's" trials shows a similar result.

Applying this empirical formula to the proposed new subsidised British cruisers of 750 feet in length, and supposing them to have the same coefficient of fineness as the "Drake," we find that their speed would be 29·7 knots before their resistance would increase faster than as S^2. But if their coefficient of fineness were ·675, then the highest speed of minimum resistance would be only 23·2 knots.

Maximum Speed at Fixed Maximum of Resistance.

From the "Greyhound" experiments it appears that up to 8 knots the resistance varied as S^2, and that at 10 knots $R_1 \propto S^{2·825}$ it is required to find the speed of the "Drake" before the resistance R_2 will $\propto S_2^{2·825}$

Using the same values as before, except that—

$$S_1 = 10 \text{ knots.}$$

we have—

$$S_2 = \frac{500^{0·83} \times ·575 \times 10 \text{ knots}}{172^{0·83} \times ·525}$$

$$S_2 = 27 \text{ knots.}$$

Thus at 27 knots the resistance of the "Drake" will vary as $S^{2·825}$ and the net H.P. for propulsion only should vary as $S^{3·825}$. But by reference to Table I., line 4, it is seen that the I.H.P. between 20·03

knots and 22·16 knots varied as $S^{4\cdot16}$. With the original blades, of 152 square feet of helicoidal area, it appears that between 22 knots and 23 knots in the "Drake" the gross I.H.P. varied as $S^{6\cdot736}$; in the "Leviathan" as $S^{5\cdot636}$; the "Good Hope" as $S^{7\cdot716}$, and "King Alfred"[1] as $S^{3\cdot8}$ and in the "Kent" as $S^{7\cdot3}$. This discrepancy disproves the theory of the increase of I.H.P. being entirely dependent on hull resistance at the higher speeds, and that the hull resistance increases suddenly as S^7 or S^{10}.

Applying this to the proposed cruisers of 750 feet length we find the speed at which the resistance will vary as $S_3^{2\cdot825}$ thus:—

$$S_3 = \frac{750^{0\cdot83} \times \cdot575 \times 10 \text{ knots}}{172^{0\cdot83} \times \cdot525}$$

$$= \begin{cases} 37 \text{ knots if coefficient of fineness were } \cdot525 \\ \text{or } 34 \quad ,, \qquad ,, \qquad = \cdot575 \\ \text{or } 28\cdot9 \quad ,, \qquad ,, \qquad = \cdot675 \end{cases}$$

These are rough approximations of the speeds we may expect to get in very large ships when we have improved our methods of propulsion to such an extent as they might be improved by judicious experiments. We shall certainly find that it is not the resistance of the ship that increases rapidly to the seventh or tenth power of the speed, but that it is the screw propellers which fall off in efficiency at the higher speeds with terrible rapidity, and that thus the larger part of the G.I.H.P. is spent uselessly. I am aware that the results given above do not accord with the results deduced from model experiments, but until towing experiments on large ships in deep water have proved that the resistance of long fine ships increases suddenly as the fourth to the tenth power of the speed, I must continue to regard the above results as being nearer to the truth than the results obtained from model experiments.

Speculative Calculation of Resistance of H.M.S. "Drake."

The following is a rough attempt to calculate the resistance of the "Drake" from the results of the trials of the "Greyhound" and other ships:—

R_4 = resistance of "Greyhound" at 4 knots, or S_4.
R_6 = ,, ,, 6 ,, S_6.
R_8 = ,, ,, 8 ,, S_8.
R_{10} = ,, ,, 10 ,, S_{10}.
D_1 = displacement of "Greyhound" = 1,160 tons.
C_1 = coefficient of body = ·575.
L_1 = length = 172 feet.
K = a constant number = 9·5.

Then— $$R_4 = \frac{S_4 \times \frac{D_1^{\cdot666} \times C_1}{L_1}}{K}$$

[1] The "King Alfred" had screws of increasing pitch, which gave lower coefficients of performance than the "Drake's" screws of uniform pitch and of 210 square feet of helicoidal area. See Table II.

$$R_4 = 16 \times \cdot369 \div 9{\cdot}5.$$
$$= 16 \times \cdot03884.$$
$$= \cdot62 \text{ tons; by experiment } R_4 = \cdot60 \text{ tons.}$$

$$R_6 = 36 \times \cdot03884.$$
$$= 1{\cdot}398 \text{ tons.} \quad \text{By experiment } R_6 = 1{\cdot}4 \text{ tons.}$$

$$R_8 = 64 \times \cdot03884.$$
$$= 2{\cdot}4857 \text{ tons.} \quad \text{By experiment } R_8 = 2{\cdot}5 \text{ tons.}$$

At 10 knots the resistance of the "Greyhound"—

$$R_{10} = S^{2{\cdot}083} \times \cdot03884 = 121{\cdot}1 \times \cdot03884$$
$$= 4{\cdot}7 \text{ tons.} \quad \text{By experiment } R_{10} = 4{\cdot}7 \text{ tons.}$$

Resistance of "Drake" at various speeds—

$$R_{speed} = \frac{S^x \times \dfrac{D_2^{\cdot666} \times C_2}{L_2}}{\dfrac{D_1^{\cdot222}}{D_2^{\cdot222}} \times K}$$

The value of x varies from 1·90 at the lower speeds to 2·005 at 22 knots to 2·015 at 24 knots to 2·04 at 26 knots (see Table I., line 14), and to 2·083 at 27 knots.

The resistances at the various speeds are shown in Table I., line 16. They range from 8·68 tons at 9·5 knots speed to 73·2 tons at 24 knots, and 92·4 tons at 26 knots. They are calculated from $S_a^x \times 0{\cdot}12 = R$ $(0{\cdot}12 = K_1)$.

I have calculated out these resistances with the view of ascertaining the highest limit of speed that we may hope to gain from practically perfect propellers. But whatever the actual tow-rope resistance would be found to be, if we could tow the "Drake" at all speeds up to 27 knots, it is very certain that there is a large amount of power still lost by the latest propellers tried on the "Drake," and that there is ample room for improvement if we take the right road to get it, and are not dominated too much by the ideas of the past, and by the results of model experiments. The Official Report, 21st April, 1903, of the trials of the "Hyacinth" and "Minerva," indicates that it is possible to increase the maximum speed of the "Hyacinth" to 20·5 knots, and of the "Minerva" to 19·5 knots. Their maximum speed in the late trials was 19·67 and 18·59 respectively.

Proportion of Helicoidal Propelling Area to I.H.P.

Nothing is more striking than the difference in practice respecting the proportion of I.H.P. to the square foot of helicoidal area, projected area, and disc area in these days from that which existed in former years. In H.M. ships, between 1855 and 1870 the proportion ranged from 6 to 12-H.P. per square foot of helicoidal area and projected area.

In the "Iris" and "Mercury," in 1878, there were 14-I.H.P. per square foot of disc area, and 38-I.H.P. per square foot of helicoidal area, with the four-bladed screws of 18·5 feet diameter, and 53-I.H.P. per square foot of helicoidal area, with the four-bladed screws of 16·25 feet diameter, at maximum speeds and highest powers, these latter giving the best results.

In the third-class cruisers of the "Prometheus" type, there are about 37-I.H.P. per square foot of disc area, but there are 148-I.H.P. per square foot of helicoidal area.

In the second-class cruisers of the "Hyacinth" type there were 150-I.H.P. per square foot of helicoidal area. And in the case of the latest and largest cruisers, "King Alfred," "Good Hope," "Leviathan," and with the original screws of the "Drake," there were about 200-I.H.P. per square foot of helicoidal area. The later screws of the "Drake" are 210 square feet in helicoidal area, and have 150-I.H.P. per square foot of helicoidal area.

In the United States' cruiser "Columbia," of 22·8 knots speed and 18,000-I.H.P., there are 112-I.H.P. per square foot of helicoidal area. In the German "Kaiser Wilhelm II.," of 40,000-I.H.P., there are about 170-I.H.P. per square foot of helicoidal surface.

The proportion of helicoidal area to I.H.P. to secure the best results and the highest possible speed is worth most serious attention —far more than it has yet received in the provision of screw propellers for war-ships and fast, high-powered mercantile steamers. In the case of H.M.S. "Drake" the greatest efficiency was attained between 15 and 20 knots, when there were only 30 to 70-I.H.P. per square foot of helicoidal surface. As the proportion rose to 150 and 200-I.H.P. per square foot of helicoidal surface, so the efficiency fell off. The decline in efficiency at the higher speeds has been ascribed entirely to the enormous increase in the wave-making resistance of the ship. I suggest that it is not so—but that a very large part of the decline in efficiency is due to the enormous waste of power due to insufficient helicoidal area of the blades generally, *and to insufficient width at the end of the blades, and to the radial form of the blade surface being unsuitable to the high speed of the propellers, as I pointed out in a letter to the Admiralty in June, 1902.* The proportion of I.H.P. to area of helicoidal surface must, of course, vary in ships of various block coefficients, and proportions of beam and length. The longer the ship, and finer the lines of the ship, the larger may be the proportion of I.H.P. per square foot of helicoidal surface, but in no case is it desirable that there should be more than 130-I.H.P. per square foot of helicoidal surface in sea-going ships having a coefficient of fineness of about ·5, and for ships having a coefficient of fineness over 0·6, the proportion of I.H.P. to helicoidal area should be approximately 70 to 1.

Frictional Skin-Resistance, Edge and Thickness Resistances of Propeller Blades.

This matter received much attention from Mr. Isherwood, of the United States Navy, from the late Mr. Blechynden, and many others. I agree with those who consider that the increase of area, *per se*, does not lead to a large and useless expenditure of power. In H.M.S. "Bullfinch" in 1861-62, a three-bladed propeller was substituted for a two-bladed propeller of practically the same diameter, pitch, and

length, but the three-bladed screw had about 50 per cent. more surface. The results were as under:—

——	Revolutions.	I.H.P.	Speed.	$S^3 \times I.M.S.$ I.H.P.	Slip per cent.
Two-bladed screw	195	254	8·545	324	23
Three-bladed „	185·5	249	8·541	329·5	17

There was no loss here from increased friction-surface and edge resistance. Speaking from sea-service experience, I have no doubt that in head winds and rough water the three-bladed propeller, with its 50 per cent. greater area, would have shown a more decided advantage over another similar vessel with a two-bladed screw, by keeping up a much higher speed.

The case of H.M.S. "Shannon," in 1862, with screws 18 feet diameter, was also remarkable, the results being as under:—

Description.	Pitch.	Revolutions.	I.H.P.	Speed.	I.H.P.	I.H.P.	Slip.
Two blades... ...	23·2	58·6	2,057	11·28	164	522	17·8
Mangin	25·1	53·2	2,033	11·33	168	534	14·0
Two blades... ...	24·9	57·4	2,096	11·08	153	485	21·0
Four „	*23·8*	*53·2*	*2,023*	*11·55*	*179*	*569*	*7·0*
Two „	24·9	57·7	2,084	11·01	151	478	22·0
Six „	23·7	49·7	1,956	11·21	169	538	3·2
Three „	23·7	56·1	2,055	11·49	175	555	12·0

Thus the four-bladed screw gave the highest maximum speed and the most economical results, although the slip was more than double that of the six-bladed screw. The proportion of I.H.P. to helicoidal surface was as 20 to 1. The helical velocity at the end of the blades was only about 33 knots, against about 70 knots in the case of high-powered modern propellers; but my investigations show that in the United States cruiser "Columbia" and other modern ships the power required to overcome the resistance due to the skin-friction, edges and thickness of the blades, does not amount to more than four per cent. of the I.H.P. at any speed if the edges and surfaces are in good condition. When the pitch and diameter remain the same in two similar screws, but having different areas of helicoidal surface, the revolutions, N, will vary inversely as the 0·123 power of the areas, thus:—

$$N_2 = \frac{A_1{}^{\cdot 123} \times N_1}{A_2{}^{\cdot 123}}$$

The marked improvement in the speed of the "Drake," from 23·03 knots to 24·11 knots, by the increase of the helicoidal area from 152 square feet to 210 square feet, is a further proof that the truth established by the trials of the "Bullfinch" and "Shannon" still holds good to-day. I have therefore allowed four per cent. for the propeller friction, etc., in my calculations.

Friction of Engines and Load—Internal Friction.

This is variously estimated by various authorities. I am of opinion that it varies considerably in different engines and in different condi-

tions of the same engines and ship, as, for instance, when the engines are badly balanced, or the ship is weak in her structure, and there is excessive vibration therefrom.

Under fair circumstances, I consider 10 per cent. of the I.H.P. is a just allowance for the combined engine and load friction for modern engines, having all the latest improvements in design and workmanship, and the great increase in modern initial and mean steam pressures. In the United States triple-screw ship "Columbia," the shaft H.P. was calculated to be nearly 82 per cent. of the I.H.P. In the calculations of the results of the "Drake," I have assumed that 86 per cent. of the I.H.P. is delivered to the screw shaft for propelling the ship and disturbing the water, after allowing 10 per cent. for engine friction and 4 per cent. for unavoidable propeller resistance. These are denoted in Table I., as P_e for the power to overcome engine friction, and P_f for the power to overcome friction and resistance of the propellers; and P_n indicates the net shaft power = 86 per cent. of the I.H.P. at all speeds.

Power Expended in Producing Recoil of Water.

I do not make much use of the popular term "slip" in connection with screw propulsion for reasons too numerous to mention. But we are all well aware that the best results are not always obtained by the propellers which give the largest or the smallest amount of "slip." That propeller is best which gives the largest value at all speeds to C_s and C_d when—

$$C_s = \frac{S^3 \times I.M.S.}{I.H.P.}$$

and—

$$C_d = \frac{S^3 \times D^{0\cdot666}}{I.H.P.}$$

If we can increase the value of C_s and C_d at all speeds, *and especially at the highest possible speeds*, it is not a matter of economic importance whether an apparent "slip" of 5, 10, 20 or 30 per cent. be shown.

Now there is a certain proportion of power which I indicate by P_w in Table I., which must be expended on the water, whatever the velocity of the feed or of wake, or whatever the eddy motion may be. We cannot control the motion of the water around the screw unless we can alter the form of the stern lines, which is practically impossible. But if we design the propellers on the very simple and practical principle of making the helicoidal area to bear a certain liberal proportion to the maximum I.H.P., say one square foot to 70-I.H.P., we have the power in our hands to reduce that surface at a very small expense of money and time in the event of our finding that the required I.H.P. and speed of ship be not obtained in consequence of the pitch and area of the blades being too great for the engines. It is possible that a reduction of pitch may give the increased number of revolutions and increased speed required, together with great economy, but if that reduction of pitch were not found sufficient to get the required power and speed, then a reduction of the area of the blades, either by reduction in diameter or in width, could be effected at very small cost in time and money. I am convinced that

a very great improvement would be made in the average passages of nearly all our high-powered steam-ships if the helicoidal area of their propellers were increased by 30 or 40 per cent., or by the substitution of four-bladed screws for three-bladed ones. But great judgment would be required to design the screws of four blades to get the best possible results. A mere rule-of-thumb application of the principle would be attended with results perhaps not worth the cost of the alteration.

The expenditure of power in producing the water recoil P_w is calculated from the simple formula :—

W = weight in tons of water acted on per minute.

= (disc area — boss area) × Pitch × Revolutions per minute ÷ 35 cubic feet.

v = velocity of water acted on in feet per minute.

D = Displacement of ship in tons.

V_h = speed of ship in feet per minute.

$$\text{Then } v = \frac{D \times V_h}{W}$$

The proportion of power P_w expended in producing this unavoidable recoil of the water to the power, P_p, expended in overcoming the tow-rope resistance of the ship is given by the formula :—

$$w = \frac{W \times v^2}{D \times V_h^2}$$

$$P_w = \frac{W \times v^2 \times P_p}{D \times V^2} = P \times w = \text{H.P. spent on recoil.}$$

Referring to Table I., line 20, it will be noted that the proportion of power P_w to P_p continuously decreases as the speed of the ship increases until at the highest speed it is only about 34 per cent. of P_p. I have reasons to suspect that by a slight alteration of the blade surface the power expended on P_w may be somewhat diminished at all speeds. But that is a matter to be practically tested by experiment in a vessel of high speed and in deep water, and any discussion thereon at present would be futile.

Power Required to Overcome Rotational Resistance.

To ascertain approximately the proportion of power expended in overcoming rotational resistances it is desirable to consider extreme cases.

Consider the most simple case; that of a Smith's or common screw, 10 feet diameter, 2 feet length, diameter of boss 2 feet, fitted to an imaginary ship 420 feet long, 30 feet beam, 15 feet draught, coefficient of fineness 0·500; imaginary engines of 30,000-I.H.P.; immersion of centre of screw, 7·5 feet. The ship is free in deep smooth water, no currents. Pitch of screw infinitely great. What will be the I.H.P. when the screw is driven 100, 150, and 200 revolutions per minute? What will be the maximum number of revolutions per minute when the I.H.P. is 30,000? Practically all the power will be expended in overcoming the rotational resistance of the screw, for

there will be no speed ahead. In this case P_r, which represents the power expended in overcoming the rotational resistance, in Table I., line 25, will be = 1·00; and P_p, which represents the useful propelling power, will be = 0·0. Consider another screw of the same dimensions, but of 31·4 feet pitch, to be substituted for the first screw, and find the I.H.P., when this propeller is driven at an equal number of revolutions to the former. Note also the mean revolutions per minute when the I.H.P. is 30,000. The ship will have considerable speed ahead, and if the tow-rope resistance of that vessel at that speed be known, the value of P_r and P_p may be calculated. Repeat these operations with screws of pitch-ratio 2, 1·5, 1·25, and 1·0, and from the results the proportion of P_r to P_p may be approximately calculated. I need not say that I have not made such experiments with a 420-foot ship as those above referred to, but I have investigated this matter as far as my means have allowed, and it appears that the proportion of power expended in overcoming the resistance to rotation at normal pitch-ratios, say, under 1·5, increases at high speeds much more rapidly than the power expended in producing propulsion of the ship and in producing water recoil. (See Table I., lines 17 and 25.) This point is clearly shown in my analysis of the trials of H.M.S. "Kent," founded on the results published in the *Times* of 20th February, 1903.

To ascertain the best form of blade I designed in the first place a model with pliable blades of infinitely great pitch. These blades were therefore planes at right angles to the plane of revolution, and consequently produced no propelling effect, all the power applied being expended in overcoming their rotational resistance.

These pliable blades could be bent by hand to any form desired, and by curving the blades backwards from the direction of rotation, the rotational resistance at a given number of revolutions was diminished, up to a certain limit approximately as the cosine of the angle of recession. But it is obvious that the blades may be so curved that while the rotational resistance is thereby diminished, the propelling efficiency may be reduced also.

The problem then was to ascertain the form of curve for screws of ordinary pitch-ratio which, with the minimum of rotational resistance, should give the greatest propelling thrust for the power applied. That form of blade gave a divergent sternward current and drew its feed supply of air from forward of the screw.

The ordinary or Griffiths's propeller blades are normal, or at right angles to the plane of revolution, that is, the screw surface is practically that of a square-threaded screw, and consequently experiences a large amount of rotational resistance, especially at high speed of revolution and high pitch-ratio, and also in some cases where the pitch-ratio is too great for the form of the ship. Many hook-shaped and spiral blades, have been designed during the last fifty years, such as the Nystrom and Hirsch blades, to gain an increase of propulsive efficiency, but the increase of the rotational resistance of those hook-shaped blades and disturbance of the currents flowing to and from their propelling surfaces, have caused the efficiency of those propellers at high speed to be less than that of the ordinary screw. It is evident that whether a true-screw surface of metal be curved, V-shaped, or square, the travel in a metal nut will be the same if the pitch be the same, but in the case of water or air we have a yielding fluid to deal with, which fluid admits of slip. But we have not to consider so much the per-

centage of slip, but the more important matter of the maximum speed of ship that can be obtained, and the value of the coefficients at all speeds. These coefficients being:—

$$\frac{S^3 \times I.M.S.}{I.H.P.}$$

and—

$$\frac{S^3 \times D^2_3}{I.H.P.}$$

The Power P_r, line 25, required to rotate the propeller with my form of blade becomes $P_r \times$ cosine of angle of recession, while the propulsive efficiency is not reduced, the surface near the periphery being increased in area, and the curvature at that part being arranged to get the best results for propulsion.

When we increase the pitch of a screw of ordinary design beyond a certain narrow limit we do not increase the propulsive forward thrust to the same extent that we increase the resistance to rotation.

Take any very small surface of the driving face of the screw where the pitch angle is less than 45°, and compare the circular or rotational velocity with which it moves with the forward velocity of the same small area in the direction of propulsion.

The following shows approximately the circular velocity of a small patch of the propelling surface of the "Drake's" screws (of 210 s.f. helicoidal area) at different diameters, when the speed of the ship and forward speed of the screw surface were 17·93 knots and 24·11 knots. The screws are 19 feet in diameter.

Diameter.	Forward speed of ship and of propelling surface.	Circular or rotational speed of propelling surface.	Forward speed of ship and of propelling surface.	Circular or rotational speed of propelling surface.
feet.	knots.	knots.	knots.	knots.
18	17·93	48·8	24·11	68·2
16	17·93	43·4	24·11	60·6
14	17·93	38·0	24·11	53·2
12	17·93	32·6	24·11	45·8
10	17·93	27·1	24·11	38·4

The helical velocities of the propelling surfaces are slightly in excess of the circular velocities, and are used in calculating the frictional edge and thickness resistances of the blade.

Mr. Tennyson d'Eyncourt, in his paper on "The Limit of Economical Speed of Ships," states that he found from actual trial results that "at about 12 per cent. above the limiting speed it (the I.H.P.) is varying as the seventh power of the speed, whilst the wave H.P. varies as v^7 at the limiting speed, and as v^{10}, or sometimes as a higher power of v, at 12 per cent. above the limiting speed." Those figures are, of course, calculated from the gross I.H.P. of the ships tried, and accurately represent the facts *as they appear;* but as they are not calculated on tow-rope experiments on full-sized ships of deep draught at the speeds referred to, I cannot accept them as being perfectly correct indications of the growth of the hull resistance alone at those speeds.

According to Joessel's formula, given in Taylor's "Resistance of Ships," page 27, the resistance of a plane of area, A, moving perpendicularly to itself in sea-water becomes for speed in knots,

$$R_s = 4{\cdot}62\ A,\ V^2.$$

From this the wave resistance of one foot square at 20 knots would be 1,848 lbs., at 40 knots 7,392 lbs., at 60 knots 16,632 lbs., and at 70 knots 22,514 lbs.

Now the screw surface does not move perpendicularly to itself, but at angles varying from 45° near the boss to about 21° at the periphery. From the time of Bossut in 1777, and Beaufoy in 1798, to the present day, no experiments appear to have been made on the resistance of planes at all angles from 0° to 90°, and at speeds from 10 to 70 knots; and for determining the resistance of planes at high speed the experiments hitherto made are almost useless. But I think we may, without great error, allow that the resistance of a plane at a given angle will vary as some power, y, of the velocity, V, and that, as the velocity increases beyond certain limits, the value of the index, y, will probably increase also.

Now it has been calculated from the I.H.P. that at about 12 per cent. more than their limiting speed the power required to overcome the total resistance of ships increases as S^7, and the power required to overcome the wave-making resistance increases as S^{10}, that is, say, when a ship 400 feet long is driven at 22·5 knots and over, or a 750-foot ship at 30·6 knots.

Now the smallest pitch-angle that any ordinary propeller has at its periphery is about 18° degrees, it is therefore not unreasonable to suppose that the wave-making resistance of the surface of the propellers (which surface makes angles varying, in the case of the "Drake," from about 21° at the periphery to about 45° near the boss) at circular speeds, ranging from 38 knots near the boss to 68 knots near the periphery, when the ship is going at the highest speed, will vary quite as much, or rather much more, than the resistance of the hull, at about one-half or one-third of the circular speed, that is, from 18 to 24 knots.

After many small experiments and investigations of the trials of ships and propellers at the highest speeds, I have arranged an empirical formula for calculating the power which is expended at all speeds for overcoming the rotational resistance of the screws. I know the formula given by Mr. Calvert in the 28th Volume of the *Transactions*, I.N.A., but the very simple formula I propose allows for the varying angles of the propelling surface, and its varying velocities. Time, however, will not permit me to give details of the means by which this formula has been constructed.

Let G = the rotational speed in knots of the radius of resistance of the propelling surface.

y = variable index of the speed G. (It is to be noted that this index y for the rotational power required is of very nearly the same value as the index, $x + 1$, for the resistance of the hull. (See Table I, lines 14 and 23.)

K_2 = 0·06, a constant derived from experiments.

Then horse-power required to overcome the rotational resistance of the screws at various speeds will be—

$$P = G^y \times K_2 = G^y \times 0{\cdot}06.$$

It will be noted, by referring to Table I., lines 21 and 25, that the proportion of power expended on overcoming the rotational resistance of the screws rises rapidly with the increase in the number of revolutions of the screws. *This is the matter which I claim to be of paramount importance*, and to which I consider too little attention has been paid hitherto. I have given very many years to the solution of this problem—the reduction of the rotational resistance of propellers, and the utilisation of the power so saved to the direct propulsion of the ship. But experiment alone on a ship at the highest powers can prove the advantages of my proposals, for those advantages cannot be shown at lower powers and low speeds.

Ordinary Radial Surface Screws of Three or Four Blades of Maximum Efficiency at Highest Speeds.

If we have a screw or screws of good pitch-ratio, and whose helicoidal area is properly proportional to the H.P., to get the highest speed and maximum of efficiency possible with radial blades we should have—

$$P_p + P + P_r = P_n$$

and there will be no loss of power from "churning" or loss due to insufficient blade area or to excess of blade area When such unnecessary expenditure of power appears, as it does in some of the trials of the "Drake" and many other modern ships, it is represented as P_l in Table I, line 27.

This is the useless expenditure of power which can be easily avoided by judiciously modifying the form of the blades—and which I propose to reduce in all existing ships *by increasing the width of the blades at the end*, and by substituting four-bladed screws of 33 per cent. greater helicoidal area for the three-bladed screws, with narrow blade ends as at present used.

But after the total elimination of the loss P_l the question arises, Cannot the expenditure of power P_w in producing the recoil of the water, and the expenditure of the power P_r in producing only the rotation of the propellers be diminished, and the power so saved be utilised in increasing the value of P_p so as to get a much higher speed of hull?

I have made many small model experiments, and have, I believe, fairly exhausted the subject, but, as I have stated previously, I consider all model experiments as giving merely indications of the lines on which to pursue investigations and experiments on full-size scale. I do not claim that any definite laws can be deduced from my model experiments on the reduction of the resistance to rotation of blade surfaces, curved and receding, such as I propose, but so far as my experiments and speculative investigations go, they show that *by reducing the width of the blades very considerably near the boss, and by curving and receding the blade surface as described*, the resistance to rotation may be so diminished that from 30 to 50 per cent. less power will have to be expended on rotation only, and that the power so saved from reduced resistance to rotation may be expended:—

1. In giving a higher number of revolutions to the curved bladed screw of pitch, diameter, and area, equal to the ordinary screw with radial blades, and a higher speed of hull; or,

2. That the screw with the curved receding blades, if of the same diameter and pitch, may have the width of the end of the blades very much increased without the revolutions of the engines and the maximum power of the engines being increased or reduced thereby, *and that such increased area at the end of the blades, and reduction of width near the boss, would lead to a considerable increase in the maximum speed of the ship and large reduction in the number of revolutions required per minute to obtain any required speed;* or

3. For very long ships of fine lines these curved receding blades with wide ends may have the same diameter and total area as ordinary blades, but a higher pitch-ratio in order to obtain high speed of hull with a moderate number of revolutions per minute. If in this case it were found that insufficient revolutions, I.H.P., and speed were attained, the question whether the pitch ought to be reduced, or the blades reduced in diameter, must be ascertained from calculations made on the results obtained by that particular ship and propeller.

The total changes in screw propeller design I propose to effect are considerably wider than those I have brought to your notice at present; and here I would point out that a change of propellers can be effected at less cost than any changes in connection with boilers and engines, and that such changes cannot give rise to any trouble after they have been adopted. Every saving of power and increase of speed by the screw propeller which may be effected is of the most far-reaching value in war and commerce, and cannot introduce any countervailing disadvantages, such as sometimes attend the introduction of new forms of engines or types of boilers.

Here I must state that I am aware that, in proposing to increase the width of the end of the blades, I am reverting towards the earlier form of blade—and abandoning the fashion introduced by the late Mr. Griffiths. But I must point out that the conditions now are different from what they were forty or even fifteen years ago; also *that the locality of the propelling surface is of as great importance as the proportion of the area of that surface to the maximum I.H.P.* For *one* square foot of surface at or near the periphery is equivalent to at least *eight* square feet at or near the semi-radius of the blade. Thus it is possible to have propeller blades of 100 square feet of area arranged with narrow ends and great width near the boss, and yet making more revolutions with a given H.P., and giving less speed and efficiency than another propeller of the same pitch and diameter, and less total helicoidal area, *but having greater width at the ends of the blades and less width near the boss.*

It has required many years of scientific research and hundreds of trials to bring the ordinary radial-surfaced screw to its present condition of efficiency, and I therefore trust that the system I propose may have a few preliminary trials in order to develop its highest possibilities. A large number of trials of vague, rule-of-thumb changes, is not desired, and is not necessary, but certain developments should be proceeded with cautiously, according to the indications progressively given by the earlier trials which may be made by this propeller.

Multiple Propellers.

Multiple propellers were employed nearly fifty years ago, and the turbine system is bringing them again into notice. For nearly thirty years I have advocated triple propellers, *with three isolated engine-rooms*, in order to obtain as much security as possible for some portion of the propelling power during battle. There are, in my opinion as a mere sea-going engineer, a dozen good reasons for the adoption of triple propellers in large high-speed ships for every single reason urged against it. I cannot consider that certain foreign Powers, such as Russia, France, and Germany, have been hasty and injudicious in adopting triple propellers for their large war-ships. Germany, alone, has nearly forty large war-ships built and building with triple propellers, and I hope that we may soon give triple propellers a trial in some very large ships. Admiral Melville, of the United States Navy, has so admirably stated the case for triple screws that I have nothing to add to that which he has said.

The introduction of triple screws in vessels where there is an installation of over 20,000-H.P. is just as logical a development of machinery design as the introduction of twin screws was a generation ago.

In the case of twin screws it was found that the tactical and strategic advantages surpassed the economical and structural benefits that were looked for. And so it has been with the triple screws. The naval strategists of Germany, Russia, and France now find that the tactical advantages alone are sufficient to demand installation of three screws, since ships with triple screws have a manœuvring power that cannot be secured with ships fitted with only two screws.

With reference to triple screws for war-vessels, I am of opinion that for battle-ships it may be of advantage that the centre propeller should have only two blades, for the following reasons:—

a. That when the centre engines are not working that propeller may be placed in the vertical position, and that in that position it will not retard the vessel so much, or require so much power to drag it, as a three or four-bladed screw would do, either when fixed or revolving, when the ship is going ahead, or with engines stopped, or in going astern, towing, or coming to anchor.

b. That the two-bladed centre propeller, being kept connected with its engines, it could be used immediately whenever it may be required Furthermore, for battle-ships under 30,000-I.H.P., I should allocate two-fifths of the power to each wing screw, and one-fifth of the power to the centre screw, and this small portion of power to to the centre screw would give a speed of nearly 12 knots to ships of the "Duncan" and "Russell" class, or 15 knots to the large cruisers of the "Drake" and "Kent" classes.

c. That, as it is necessary that all the mechanism on board ship should be kept as simple as possible, small engines for rotating the centre propeller, to reduce its resistance, when not propelling, should not be fitted, nor should any gear be fitted to the other main engines to drive the centre screw when that is disconnected from

its main engines. This arrangement would give ten screw blades to these war-ships instead of the six blades now generally employed in twin-screw ships.

For very large naval cruisers and subsidised mercantile cruisers, such as the proposed Cunarders, the triple screws would all have equal engine power, and the centre screws would not need to remain idle, as these ships would generally have to steam at speeds exceeding 18-knots, and therefore the centre screw, as well as the two wing screws, should have four blades each. By this proposed arrangement the propelling power in these ships would be exerted by twelve separate blades, instead of six blades only, as at present in twin-screw ships having three-bladed screws.

In war-service we must expect that the propellers may be, and will be, much more frequently damaged than in ordinary service during peace. Accidents to propeller blades of war-ships and mail-steamers occasionally occur even under ordinary circumstances, and when one blade of a three-bladed screw is broken off or seriously damaged, the remaining two blades will, if the screw be used for propulsion, throw a very heavy and unequal stress on the shafting, and cause excessive vibration of the ship. If one blade of a four-bladed screw be broken, only one-fourth of the propelling surface will be lost (instead of one-third), and less stress will be thrown on the shaft, and less vibration will be produced if that screw be worked, so that a higher speed may be obtained than with the two remaining blades of a three-bladed screw. This is a point worthy of the consideration of executive officers, who may have to command fleets in future battles, and of ship-owners also.

In consequence of the four blades, *if arranged in the ordinary manner*, being nearer together, that is only 90° apart (instead of 120° as in three-bladed screws), it is possible that at the highest speeds the action of the four blades may cause such a disturbance of the water or cavitation as to diminish the efficiency of propulsion at the highest speed in some cases.

I investigated this subject of the interference of multi-bladed screws and their excessive disturbance of the water causing cavitation, in 1861 and 1862, in connection with the propeller tried by Mr. Révy which had practically 12 blades surrounded by a casing forming part of the screw, and of course, revolving with it. This matter has received my attention, and I have devised means to prevent the interference of the blades with each other.

A naval sea-going engineer should think principally of the necessities of the day of battle and the week afterwards. He should place supreme value on the endurance of his boilers, engines, and propellers for the rude, hard work and stress of long-continued steaming in war, both before and after the shock of battle, and should consider that everything should be subordinated to the exigencies of actual war. Forty years back, after the conclusion of the war in China, I was appointed engineer in charge of a gun-boat which had been four years in commission, and under steam for 296 days during the previous year without any repairs in a dockyard, and the machinery and boilers were in fair working condition; but both the working and spare propellers were broken, and I had to get a spare propeller from another vessel, which exactly fitted, thanks to the principle of interchangeability which had been introduced for

those engines by Mr. John Penn during the Crimean war. That old gun-boat remained in commission for three years more, taking part in the bombardment of Shimonsaki before she went to Hong-Kong dockyard for refitting.

Forty years of practical experience, and thirty years of model experiments had failed to produce any substantial improvements in ships' propellers; but nevertheless, within the last few months we have had the speed of the "Drake" and "Hyacinth" increased by one knot, and the speed of the County class increased to 23·7 knots, which would have been impossible if the generally accepted theories of ship resistance at high speeds had been correct. Great as this increase in maximum speed has been, I am convinced that a further series of experiments will prove that even still greater maximum speeds can be obtained from all our modern ships by the simple and inexpensive plan of fitting them with new screws. The cost of such trials and of fitting new propellers would be infinitely small compared with the great advantages to be gained both in maximum speed and in economy of fuel.

In bringing this lecture to a close, I beg to quote the following sentences from a paper which was read in this Institution by Captain J. C. Wilson, R.N., in January, 1876:—"It is generally admitted that in future naval actions, the failure of the propelling power will place a vessel completely at the mercy of her antagonist. . . . Considering this and the many sources of danger arising from torpedoes, ramming, etc., I cannot consider that even twin-screw propellers afford that security from total disablement which modern warfare requires." That paper written twenty-eight years ago, contained proposals for using a turbine propeller in combination with the screw in order to obtain: 1. Greater security for the propelling power when in action. 2. Greater economy at the low speeds which were then in fashion in the Navy. 3. To obtain an enormous reserve of pumping power in case of injury to the hull from ramming or torpedoes. Special reference was made to the then recent loss of the "Vanguard," and calculations were given, showing how such combined pumping and propelling power might have saved that ship. Since then we have had to deplore the loss of H.M.S. "Victoria," and although it is possible that no amount of pumping power would have saved that ship, as her water-tight doors were not closed, it is possible that a large pumping power might have delayed her sinking sufficiently to have permitted the whole of her crew to be saved. I repeat that I do not believe in finality in engineering, and I think that it is still necessary, in spite of our experience with the "Waterwitch" and other hydraulic propeller boats, that the war-ship of the future should have a portion of its steam-power assigned to one or more steam turbines, driving high speed centrifugal pumps which could be used for propelling the ship at low speeds, or assisting to drive the ship at the maximum speed, and for keeping the ship afloat in cases of injury from torpedoes, ramming or gun-fire by pumping out many thousands of tons of water per hour. The naval battles of the future will probably leave few of the opposing ships floating, after an hour's fighting, and those which do float will be more or less crippled; but that side which has the largest number of cripples afloat, *and capable of moving*, if only at 8 knots speed, will be able to compel the surrender of the enemy or to effect his complete

destruction, and thus to hold command of the sea against that particular enemy.

It is for the preservation of some portion of the propelling power in a hard-fought battle that I have supported the triple-screw system, but it is only by the adoption of the combination of the hydraulic system with screw propulsion that the greatest protection from sinking by torpedoes or ramming can be obtained. The adoption of such a combination of hydraulic with screw propulsion is a question for the earnest consideration of those admirals and captains who may have to command ships in action. But they may reasonably ask,—Why not let well alone? To that question I can only refer again to "the hour of battle and the week afterwards"; to the "Belleisle" experiments and the "Prince George," which latter ship required the pumps of another ship to help to keep her afloat; and I would ask any captain what he would give for the possession of pumps of 1,000 or 2,000-H.P., if his ship were rammed in battle as the "Prince George" was? The details for the application of such a combination rest with the engineer, but the adoption of the combination rests with the naval officers at the Admiralty, upon whom the strength of the Fleet and the safety of the Empire must depend.

The CHAIRMAN (Admiral the Hon. Sir E. R. Fremantle, G.C.B.):—I do not quite understand on what grounds you advocate the four blades.

Mr. QUICK:—Because if one is broken off we have three blades remaining, and we get less strain on the engines. If you get one blade broken off the three-blade propeller, the strain on the engines and ship is excessive. The vibration is excessive.

The CHAIRMAN:—I am sure it would be your wish that I should give Mr. Quick your thanks for the able lecture he has given us to-day. I am afraid it is rather too technical in character for us to discuss, especially those of us who did not have the advantage and opportunity of seeing it before we came to the meeting. I confess that I read the paper before, but I found a good deal of it was a matter of calculations which I did not completely follow. It would have taken me a great deal of time, even if I had been capable of following them to their legitimate conclusion. But there is one thing brought out I think fairly clearly. A great many years ago there was a discussion in the old United Service Institution, in which, if I recollect aright, Mr. Scott Russell, a very great authority, said that with all trials made with the screws, it really did not make much difference what the screw was: so long as they turned round the ship went ahead, and that the difference between the shape of the screw was a matter of very small moment compared to the horse-power developed and the number of revolutions. We had at that time four-bladed, three-bladed, and two-bladed screws, and for the reason I have stated we were quite happy in adopting the two-bladed screws, which could be raised—a very important matter as was thought at that time. Therefore, there has undoubtedly been some reluctance in looking to the propeller for any great advance in screw propulsion. Nevertheless, we have found that something can be done in that direction, and if Mr. Quick is right, a great deal more can be done than has been attempted up to the present. I think he has almost proved his case as regards the great increase of power which is required to drive the ship beyond the speed for which she was intended, being due rather to the friction of the screw than to the resistance of the ship. It seems to

me the paper is one well worthy of consideration by the Admiralty, who might try experiments, which, though they are not entirely conclusive, yet give one an idea of the direction in which to look. You may obtain a great deal more than you expect, or you may obtain considerably less. I think I have heard Sir William White say something to the same effect. With regard to the three screws, I had some correspondence with Mr. Quick on that subject a little time ago, and I confess I had the impression —as most naval officers have—that two screws were quite sufficient for our purpose, and that it was an additional complication to put three screws into a ship. But what ought to make us pause is that the author points out that the French, Germans, Russians and others have adopted three screws, and they consider them to be a great advantage. It is logical to say that the two screws took their place not so much for the manœuvring power they afforded—though partly on that account—but because of the great increase that had to be made in the dimensions of the cylinders and engines if we only used one screw. In the same way, I think now that we have 30,000-H.P. in some ships, we should go to three screws. The late Admiral Wilson was one of our most thoughtful officers, and anything that fell from him deserved great consideration. According to Mr. Quick, I see that Admiral Wilson said, as long ago as 1876 :—"It is generally admitted that, in future naval actions, the failure of the propelling power will place a vessel completely at the mercy of her antagonist. . . . . Considering this and the many sources of danger arising from torpedoes, ramming, etc., I cannot consider that even twin-screw propellers afford that security from total disablement which modern warfare requires." The author mentions a combination of the turbine with twin screws, which he thinks is possible, and there is no doubt a great deal of benefit is bound to accrue from having sufficient pumping power. The "Prince George," it appears, the other day had not sufficient pumping power, and she had to have another ship to help her. When a ship is disabled by ramming or by a torpedo, she will have a considerable list. In that case there is great difficulty in using one screw. Supposing she is disabled on the starboard side, and has a list to starboard, and the port screw is also disabled, that ship does nothing but turn round when steaming with the starboard screw only. If, however, she has a centre screw which is not disabled she will be able to steer very much better. I think we should always remember that with two screws there is that danger. A ship having a great list has a great tendency to turn to the opposite side from the list or to carry weather helm; if, then, she has only the lee screw to work with, it is impossible to manœuvre the ship. I wish that somebody was here who could explain why we have persistently refused to look at the question of three screws, and why it is that other nations have taken it up so very strongly. I am not aware how many American ships are fitted with three screws; but we know that Admiral Melville, who is an engineer, has written very strongly on the subject. One of the reports of Admiral Melville rather converted me to the great advantage which would accrue in having three screws. Mr. Quick alluded to one of those advantages, namely, that the centre screw can be so easily used when keeping station at moderate speed. The centre screw would be used, and the ship would steer very much better than she would steer by one screw or twin-screws, and we should only have the friction of one engine instead of the friction and loss of two engines. The other screw would be dragging, of course; but it is a fact that you could easily work a fast ship with a centre screw at about 12 knots, which would be quite sufficient for ordinary cruising in a fleet, and might be a very great economy. The lecture is one that will be of more

value in our JOURNAL than in being read at the meeting. I am sorry it was not brought forward at the Institute of Naval Architects, where, perhaps, it would have been more appreciated than it is here; but I can assure Mr. Quick that we are very much obliged to him for bringing it before us. There is a great deal in it, and I think it very likely the Admiralty may find more in it than the members of the United Service Institution. At all events, Mr. Quick has done his duty to the country in bringing this before us, and we are always obliged to officers, especially engineering officers, who study the questions of the day from an engineering point of view, and bring them before us and before the Admiralty and before the country. I thank Mr. Quick for his lecture.

Mr. QUICK, in reply, said:—I should like to make one remark with regard to the statement made by Sir Edmund Fremantle as to the advantage of the centre screw when the ship is injured and listing. It is a most important thing, but it does not appeal to the engineer in his office, and it does not appeal to the manufacturer. The engineer in his office, and the manufacturer are principally interested in the results of the trial trip and the *kudos* arising therefrom when they are published in the newspapers. But the naval commanders and engineers who have had the misfortune to be in ships which have been rammed look on these questions from a different point of view. In 1875 I stated the same thing: that all these engineering questions should be considered by committees of sea-going officers—those who will have to command ships and fleets in action. I am strongly in favour that for all these questions, Admiralty Committees, composed of sea-going officers, should be appointed for the consideration of designs of new ships, new machinery, armaments, etc. The duty of these committees would be to report their individual opinions on the various points submitted, and their opinions would be examined and judged by the responsible Lords of the Admiralty. In this course there would undoubtedly be conflicts of opinion, but each point would be carefully investigated and fully considered by skilled and experienced officers, who would be able to give their whole time to the subject in hand, and thus prepare the case for the consideration of the Board. In this way the advantages and defects of new designs or of new inventions would be sought out by various unprejudiced minds, having sea experience, and probably valuable suggestions for further improvement would be put forward. It cannot be proved that designers and inventors are always the best and most unprejudiced judges of their own or of other people's proposals. I have no doubt but that the maximum speed of our large cruisers and mercantile liners could be increased by one knot or more per hour by a change of their propellers, and the speed of our battle-ships could be largely increased also, as well as their economy at lower speeds. The cost would be very small, and this question should be referred to a committee. I may say that I proposed the adoption of the triple propeller system in 1875, for which I received the thanks of our Admiralty; and on the loss of the ironclad "Grosser Kurfürst" I sent to the German Admiralty my views on the subject, and received a very handsome letter of acknowledgment; so that it will be seen that I am an old agitator for the three-propeller system. It was my paper on this subject which Captain Wilson did me the honour to read in this Institution in 1876: I had written and forwarded it to the Institution when serving on the Pacific station in 1875.

NOTE.—Great improvements have been made in the power and efficiency of pumping engines and pumps since the "Waterwitch" was built in 1886,

and the Thornycroft hydraulic torpedo-boat in 1883. At the present time, Greenwood and Batley, of Leeds, are making De Laval steam turbine engines and pumps combined up to 300-I.H.P. These weigh about nine tons, and occupy a space of about eighteen cubic yards only. A pair of 600-I.H.P. De Laval engines and pumps would weigh about thirty-six tons, and occupy seventy-two cubic yards. These engines, of 1,200 total I.H.P. would be able to pump about seventeen thousand tons of water per hour from a ship, *i.e.*, about as much water per hour as our biggest battle-ships displace. It is therefore evident that these pumps could cope successfully with an enormous amount of damage to the hull from ramming or torpedoes, which damage, with our existing appliances only, would certainly sink the ship. The water would be discharged in equal quantities astern on each side of the stern-post, so that in the event of partial or total disablement of the screw propellers the jets would propel the ship ahead at a moderate speed, and in case of injury to the rudder the ship would be steered to a certain extent by the propelling jets. Of course, if the ship were uninjured, and the screw engines were disabled, the turbine pumps would take their suction direct from the sea. It is a matter for the consideration of naval commanding officers whether the proposed additional pumping, propelling, and steering power would be in actual battle worth a few hundred pounds in cash, the occupation of seventy-two cubic yards of space in the ship and the substitution of thirty-six tons of machinery for fifty-six tons of coals.—G. Q.

TABLE I.—SCREW PROPU

1. Area of helicoidal surface of blades, in square feet ...	152	152	152	210
2. Speed of ship in knots	15·43	22·08	23·05	9·5
3. Gross I.H.P.	6,937	23,103	30,557	1,885
4. P varies as S^m between adjacent speeds. Value of ^{m} ...	3·357	6·736		
5. P varies as S^n between 15·4 kts. and higher speeds. Value of ^{n}	...	3.719	...	...
6. I.H.P. per square foot of helicoidal surface $= P \div A = Q$	45	152	203	8
7. Revolutions per minute. N...	72·3	105·9	116	47
8. Velocity of screws, feet per minute. Pitch × revolutions $= V_s$	1,771	2,595	2,842	1,076
9. Velocity of hull in feet per minute. V_h	1,563	2,237	2,335	964
10. Slip, per cent.	11·8	13·9	18	10·4
11. Estimated friction of engines and load = 10 p.c. of I.H.P. $= P_e$	694	2,310	3,055	168
12. H P. calculated to be spent in overcoming skin-friction edge and thickness resistance of screws $= P \times ·04 = P_f$	277	924	1.222	67
13. Net horse-power supplied to screws for propelling the hull and disturbing the water $= P - P_e - P_f = P_n$ ...	5,966	19,869	25,780	1,450
14. Tow-rope resistance of hull varies as $S_h{}^x$. Various values of ^{x}	1·95	2·007	2·01	1·9
15. Value of $S_h{}^x$ for various speeds	207	498	548	72·3
16. Tow-rope resistance of hull in tons $= S_h{}^x \times 0·12 = R$ (in tons)	24·92	59·78	65·78	8·6
17. Horse-power expended in propelling hull $= R \times V_h \div 14·73 = P$	2,644	9,010	10,427	567
18. Weight of water in tons, acted on by screw blades per min. = disc area − boss area × pitch × revs. ÷ 35 cubic ft. or W	25,666	37,594	41,180	15,650
19. Velocity imparted to the water, W, in feet per min. v = Displacement × $V_h \div W = v$	852	833	794	860
20. Energy of water recoil ÷ energy of hull $= W \times v^2 \div D \times v_1{}^2 = w$. D is the ship's displacement in tons ...	·544	·374	·34	·8
21. Horse-power expended in producing the recoil of the water $= P \times w$	1,438	3,370	3,540	506
22. Circular or rotational speed, in knots, of radius of resistance of blade surface $= G$	31	46	50	20
23. Power spent in overcoming rotational resistance of propellers $= P_r$, and varies as G^y. Value of ^{y}	2·9	3	3·01	2·9
24. Value of G^y for the various rotational speeds of the screws' faces. G^y	21,131	97,336	130,000	5,929
25. Horse-power expended in overcoming rotational resistance $= P_r = G^y \times ·06$. P_r	1,268	5,840	7,800	358
26. Horse-power accounted for in propelling hull, in water recoil and in rotational resistance $= P + P_e + P_r = P_a$	5,350	18,220	21,772	1,431
27. Difference between P_n and $P_a = P_1$ = H.P. lost or gained in "churning" due to any defect of design of propellers. P_1	616	1,649	4,008	19
28. Ordinary coefficient of performance $S^3 \div$ I.H.P. = coefficient $= C_s$	·53	·463	·428	·51
29. Efficiency calculated by W. Froude's *Greyhound* formula resistance ÷ ind. thrust. (Resistance here $= R$.) Coef. $= C_h$	·432	·456	·415	·37
30. Absolute efficiency by W. Froude's formula E.H.P ÷ I.H.P. $= C_e$	·381	3·90	·341	·33
31. Proportion of power spent on rotation to net power, P_n, of screw, when $P_n = 1·0$. $P_r \div P_n = C_d$	·212	·294	·302	·24
32. Proportion of power spent on rotation to power spent on propelling hull, when $P = 1·0$. $P_r \div P = C_e$ ...	·476	·648	·748	·63

a. Quick's screw with four curved and receding blades, 280 sq. feet. *b.* Area of Quick's bla
maintained by reduction of resistance to revolution by curvature and recession of surface. *c.* G
Quick's blades $= P_r \times$ cos of angle of recession = 4,823 H.P. *e.* Apparent gain or excess, probe
Greyhound and *Mutine* were ·517 and ·457. *g.* The highest values for *Greyhound* and *Mutine* w

TABLE II.—TABLE OF RELATIVE CO-

Ship.	Speed.	Co-efficient.	Speed.	e
Good Hope ...	15·91	·506	22·1	
Leviathan ...	15·23	·546	21·96	
King Alfred ...	15·16	·543	21·59	
Drake, original	15·43	·529	22·08	
Drake, new ...	15·41	·561	22·16	

I.—SCREW PROPULSION.

152	210	210	210	210	210	210	210	*a.*
23·05	9·52	13·06	15·41	17·93	20·03	22·16	24·11	26
30,557	1,885	4,014	6,520	9,872	14,801	22,534	31,409	31,409
36	3,251	2·93	2·74	3·66	4·16	3·94		...
...	...	...	...	2·74	3·07	3·41	3·51	...
203	8	19	31	47	70	107	150	112
116	47	64	75·1	87·6	98·5	111·5	122·4	122·4 *b.*
2,842	1,076	1,468	1,727	2,015	2,266	2,565	2,815	2,815
2,335	964	1,317	1,560	1,816	2,030	2,244	2,442	2,634
18	10·4	10·3	10·4	9·8	10·4	11·24	13·21	6·4
3,055	168	401	652	987	1,480	2,253	3,140	3,140
1,222	67	160	261	395	592	901	1,256	1,256
25,780	1,450	3,453	5,607	8,490	12,729	19,380	27,013	27,013
2·01	1·9	1·9	1·95	1·95	2	2·007	2·015	2·04
548	72·33	132	207	278	401	502	610	770
65·78	8·68	15·84	24·84	33·36	48·12	60·24	73·2	92·4
10,427	567	1,416	2,630	4,113	6,632	9,177	12,137	16,523
41,180	15,650	21,312	25,010	29,170	32,800	37,130	40,760	40,760
791	860	865	873	872	866	846	840	904
·34	·893	·657	·559	·48	·426	·377	·345	·343
3,540	506	930	1,470	1,974	2,825	3,460	4,187	5,667
50	20	28	33	38	43	48	53	53
3·01	2·9	2·9	2·9	2·9	2·9	3	3·015	3·015
30,000	5,929	15,550	25,330	38,140	54,560	110,592	158,000	158,000
7,800	358	933	1,519	2,288	3,273	6,653	9,480 *c.*	4,823 *d.*
21,772	1,431	3,279	5,619	8,375	12,732	19,290	25,804	26,930
4,008	19	174	*e* 12	115	*e* 3	70	1,209	Nil. *e.*
·428	·512	·553	·561	·584	·540	·479	·446	·559
·415	·377	·394	·446	·462	·502	·465	·44	·555 *f.*
·341	·336	·353	·403	·416	·448	·407	·386	5·26 *g.*
·302	·247	·27	·271	·27	·257	·343	·351	·178
·748	·631	·659	·577	·556	·493	·725	·781	·292

Area of Quick's blades, 33 p.c. greater than *Drake's* present blades, but max. No. of revolutions rface. *c.* $G^2 \times 03052$. *d.* Power required to overcome rotational resistance with ain or excess, probably due to errors of data or of calculation. *f.* The highest values for *und* and *Mutine* were ·422 and ·363.

OF RELATIVE CO-EFFICIENTS $\frac{S^3}{\text{I.H.P.}}$

Co-efficient.	Speed.	Co-efficient.	Speed.	Co-efficient.
6	22·1	·480	23·05	·394
6	21·96	·462	23·25	·397
3	21·59	·446	23·46	·419
9	22·08	·463	23·05	·428
1	22·16	·478	24·11	·446

OBSERVATIONS ON THE WAR IN SOUTH AFRICA.

AN ADDRESS DELIVERED BEFORE THE DUTCH SOCIETY FOR THE ADVANCE OF MILITARY SCIENCE (VEREENIGING TER BEOEFENING VAN DE KRIJGSWETENSCHAP) IN DECEMBER, 1901.

By Captain Jonkheer J. H. RAM,
Military Attaché with the Boer Forces under General Botha.

Translated from the Dutch, by permission of the Author, and of the Society, by F. S. ARNOLD, B.A., M.B. (Oxon.).

Continued from January JOURNAL, p. 55, and concluded.

THE enormously improved small calibre quick-firing guns, however, enable us very greatly to increase the defensive strength of the weak parts of a position; the experience gained with the Vickers-Maxim quick-firing gun, the so-called pom-pom, has not drawn favourable criticisms from every quarter. In recommending its adoption as infantry ordnance, I am acting in opposition to the views of many experts concerning this weapon. Their chief criticism is that the shell has little material effect, that on many kinds of ground it does not explode, and that the mechanism easily gets out of order. Only one of these criticisms seems to me to have much weight, that relating to the want of explosibility on soft *terrains*, of which we have, of course, many in this country. So far as the mechanism is concerned, that in use in South Africa has already been improved upon, so I cannot regard that drawback to the weapon as likely to be permanent. From the criticism based on the slight material effect produced by the shell, I differ. The material effect of a small calibre shell must, in the nature of things, be slight. It must explode well also, if it is to do any harm at all. The *moral* effect, however, and this is the factor of most importance in action, has been shown by experience to be very marked. Numberless English officers and soldiers testify to this. The fact, too, that the British War Office, which before the war thought little of small calibre quick-firing guns, ordered a large number, when experience of its effect had been gained, is sufficient proof, it seems to me, that it is a most valuable weapon.

I would here venture again to quote from Captain Slocum's report. It is probable that he was giving the opinion prevalent among English officers, when he reported to his Government:—"The Vickers-Nordenfelt automatic gun used by the Boers has a strangely demoralising effect upon an enemy. It is an effective little weapon, and the British soldier dreads it more than any other gun the Boers have.

Its pom-pom-pom in rapid succession, and unknown number, is a great strain on the nerves. It is very accurate.

"Until the 26th February, when three of them joined Lord Roberts' command, none of the British forces had this gun.

"They opened fire on the enemy's laager early in the afternoon, the other guns having been practically silent during the day, and even when they did fire elicited no response of any kind from the enemy, but the moment the "pom-pom" began, the Boers woke up in the most astonishing manner, and, from every part of their lines, opened fire. It was as if an electric spark had been dropped into a magazine.

"This tickled the British soldiers immensely, for they had 'been there' so often themselves."

The writer of the German article from which I have already quoted also speaks very favourably of this gun, notwithstanding the fact that he is a disciple of the teaching that the moral effect of fire is primarily dependent on its actual material effect. He relates, for instance, how, near Thaba-nchu, two regiments of lancers were in a very short time utterly demoralised by the fire from a couple of pom-poms.

"Everywhere I have been impressed by the fact that the Maxim-Nordenfelt is a fearful weapon, and has a great future before it."

The experience of the Dutch attachés thoroughly bears out this view. We also have always had the same impression, and we know that the Boers set a very high value on their pom-poms. The ease with which, with this small and easily-worked gun, a moving target can be followed, and the rapidity with which a quickly retreating enemy can be overtaken by a rain of projectiles, gives it a great advantage over quick-firing guns of greater calibre.

The Boer pom-pom can fire 50 rounds a minute; the projectiles are in bands of 25. The gun is sighted up to 3,500 yards. A few of these guns added to the armament of a defensive position increase enormously its power of repelling an attack. Troops in close order showing themselves even at two or three kilometres range, are forced by this gun to open out, as was apparent at Modder River. In addition to this, the gun is very easily placed in position, so as to be invisible to the enemy.

Machine guns (mitrailleurs) will be able to play a different, but still a very important, part in the defensive line.

Many of the Boers, marksmen *par excellence*, entertained a somewhat low opinion of these guns, whose chief quality was intensity of fire. Others, however, valued them highly. I remember, for instance, that on one occasion, General Viljoen, when I asked the strength of the force under him, gave me an answer which, as I afterwards found out, overstated the strength by 25 men. He explained the matter thus:—"My commando consists at the present moment not of 375, but of 350 men, but I have a hand-Maxim, and that counts for 25 men."

When, by proper training, the private soldier has been taught to use his rifle in action, without having a superior always at hand to give him orders, and the "fire strength" of the position taken up has been increased by machine and quick-firing guns, it will be safe to adopt a very thin occupation of the firing line, thereby securing the immense advantage of a powerful reserve, which can be used either to confront the enemy, who is spreading out his flanks, always with an occupied position, or to outflank him, or even to undertake a vigorous counter-attack. A counter-attack, however, brings the attacking force

into the advantageous position of defender. It is therefore, I think, only to be recommended against a very demoralised opponent.

If now we ask whether the Boer method of distributing men over a defensive position should serve as a model for us, the answer must, I think, be in the negative. Their extraordinary mobility enabled them to answer an extension of front on the part of the attacking force, obtained by bringing up men from the rear, by an extension of their own line, obtained by the transference of men from one part of the front line to another. For infantry this would be, of course, extremely difficult. In addition, the contour of the ground generally allowed this transference to be carried out, out of sight of the enemy. We should, in most cases where infantry were in occupation of a position, be forced to secure an extension of front by bringing up fresh men.

Smokeless powder conferred, in this war, practically no advantage on the attacking force, and the advantage which might have been seized by him—the possibility of rendering his artillery invisible—was but seldom utilised. The changes brought about in attack formation in this war are, therefore, to be attributed exclusively to new effects produced by the defender's fire.

At first the English endeavoured to deprive their opponents of their advantage as defenders, by night marches and attacks. These were, however, soon given up, as they were found to involve serious difficulties and dangers. Sometimes days were spent in trying to find a weak spot in the defender's positions (Spion Kop, Vaalkrans, Donkerhoek, Dalmanutha, etc.) before an attack was decided on, or attempts were made, and this especially in the later stages of the war, to manœuvre the defender out of his position.

The point to be attacked was heavily shelled in the usual way, sometimes for days together. This artillery fire generally did little damage, and was seldom replied to. The attacking troops forced their way slowly forward, covered by the artillery fire, which ceased during the actual storming of the position, or was directed to the ground in rear of the position. This fire was vigorously carried out, and, thanks to the accurate shooting of the naval guns, and the elevated positions occupied by the defending force, could be continued for a long time, during the advance of the infantry, without endangering the troops.

When I had an opportunity of watching the English artillery fire, I gained the same impression about it that I found to be generally prevalent: a shell which had fallen close to a certain mark would be followed by shots which fell hundreds of metres short or behind it.

The difficulty of ascertaining the exact disposition of the well-concealed enemy probably constrained the English to adopt this method of fire. Its material effect was naturally less than that of accurately directed fire. Its moral effect, however, made itself felt over a wider area.

But even well-directed fire had little material effect against the thinly occupied Boer line. As it was mostly delivered from flat trajectory guns, it could only reach those who left their cover. The moral effect of the artillery fire which, in the early actions, drove the Boers to abandon their positions, naturally diminished when they found, by experience, that it was harmless to them, if well entrenched.

The infantry attack, in the early stages of the war, was, as we have said, carried out by extended lines followed by troops in close order. It was to be expected that this formation, which, broadly

speaking, is the result of the experience gained in the Franco-German war, would prove to be unsuitable in face of the modern weapons. After the first few actions, the danger of allowing troops in close order to come within range of the enemy's rifles became obvious, and in the latter half of the war the attacking troops advanced in long, very extended lines, which at first followed each other at intervals of several hundred yards. The intervals were closed up as the attack progressed, so that the different lines were united on arrival at the main position. Troops in close order were discernible at a distance of over 2,000 yards, but not if in extended lines. Though the ground was generally treeless and perfectly open, the colour of the uniform of the attacking troops merged so completely in that of the ground, that, even at the shorter distances, the men were difficult to see, and a line of riflemen lying down was often entirely invisible. This invisibility gave to the South African battle-fields a remarkable character. Notwithstanding the heavy artillery and rifle fire, which told one that a vigorous action was in progress, the plain in front of the position was apparently empty. Only a very practised eye or one assisted by good field glasses could distinguish the forms of men, guns, wagons, etc., faintly outlined against the background.

A circumstance which was bound to strike the European officer, who had gained his impressions of battle from the manœuvre ground, was the great distance at which a battle was often decided. One can imagine, for instance, how little the battle of Colenso, in which the centre of the attacking infantry was brought to a stand about 850 yards in front of the position attacked, agrees with what one sees in our own and probably also in other countries on the manœuvre ground.

The invisibility which plays so great a part on the modern battle-field, forces both sides to provide themselves with the best field glasses, telescopes, or other means of observation. The prismatic field glasses, as we have said, answer their purpose admirably. The English made use, in addition, of field telescopes, and employed captive balloons very widely as posts of observation. Opinions as to the value of the captive balloon as a means of reconnaissance differ widely, perhaps in relation to the differing expectations formed beforehand.

That the Boers greatly disliked and dreaded the balloon, I have already stated, while the fact that it accompanied the English troops to Pretoria is a proof that the trouble involved in transporting it was considered as by no means uselessly incurred.

Captain Slocum reports as follows to his Government on the subject:—"The balloon which was with Lord Roberts' forces gave most valuable assistance in locating the enemy and guns. It was many times hit by rifle bullets, but was never made to descend on that account. The engineer officer who made all the ascents informed me that even if hit in the top by shrapnel, the balloon would descend only gradually."

Quite different is the verdict of Lieut.-Colonel May, who writes as follows:—

"What I have seen of balloons in South Africa, and at our manœuvres at home, leads me to doubt the possibility of their affording

much practical assistance here." ("A Retrospect of the South African War," page 123.)

The balloon used in this war was of the usual form and not of the best quality.

Concerning the formation adopted for the attack, I may add the following. In an English work by Major Callwell, R.A., entitled "The Tactics of To-day," that officer, who wrote the book during his march from Laings Nek to the Lydenburg district, recommends, as the fruit of his experience in the field, the following attack formation for an English company.

"The English Army," says he, "will be forced to abandon the traditional line formation, and to develop the company in depth, seeing that it has, in the old formation, an extension of 800 yards.

It would be better to place the sections behind each other at intervals of 150 yards, each section extended to a line of 200 yards, the men at intervals of 8 paces. In this way the company takes up a space of 200 yards in extension and 450 yards in depth. By this formation," says the author, "it is still possible for the commander to lead his company."

From the works of English authors on this war, I have gathered the impression that the attacker experienced, in a double sense, the disadvantages of tying himself down to a definite scheme of attack. (Notwithstanding the direction in the English drill-book that there shall be no "normal attack formation" such formation seems as a matter of fact to have existed.) In the first place, it became evident that the attack formation he had studied in the manœuvres, was quite unsuitable in the face of modern weapons. Major Callwell writes elsewhere in his book:—

"That regiments and brigades should have ventured only a few months ago to attack positions of the enemy in formations laid down in the drill-book, seems to us now as incredible as the famous attack on St. Privat must have seemed to the German army before Paris."

Would not the official prescription of a definite attack formation, based on the experiences of the South African War, lead to the same danger in the future? There is no certainty that the formation adopted in South Africa would be found suitable on different ground; besides this, there is no guarantee that weapons, in the next war, will not have undergone further changes. The artillery of the future defending force, for instance, is likely to be a much more powerful factor than that of the Boers, and their rifle may surpass the present in rapidity of fire. The adoption of an automatically acting rifle seems by no means impossible, while it is also by no means improbable that the English soldier will find himself opposed by an enemy more active and enterprising than were the Boers.

The English works on this war give me the impression that the disadvantage of stereotyped forms was experienced also in another respect, namely, through the inability of many officers of all ranks to adapt themselves to the demands of ground and circumstances, and their want of tactical insight and military instinct. Both of these had suffered through the mechanical study of certain forms and formulas; the creative power, which should be possessed by the true military artist, was largely replaced by a worship of mere form. The South African volunteers who fought on the English side were at first astounded at the methods of English officers on the South African *terrain*. They saw mistakes committed which they would

themselves have instinctively avoided, and found on the part of many of the English officers an unfitness for campaigning life which they could not understand in men following the soldier's profession. Still greater, however, was their amazement when they heard these mistakes defended by those who had committed them, by appeals to the drill-book, which may have been admirably suited to the English manœuvre grounds, but which on the South African veld was a most untrustworthy guide. Their feeling towards the English officer became actually hostile when they saw that the latter regarded himself, on the ground of his knowledge of the drill-book, as a more competent soldier than the *non-military* comrade, to whom the life of the South African veld had given a keener sight, a better power of observation, and a more accurate judgment of *terrain* than he himself had acquired from his exercise ground and garrison training. The war eventually taught him that, notwithstanding his training, he was, in many respects, the inferior of the untrained colonist, whose whole tactical equipment consisted of his common sense and knowledge of South African conditions.

I should be sorry to recommend Major Callwell's *schema* as the stereotyped attack formation, though there might be many circumstances in which it would be well worthy of adoption. South African conditions of ground are seldom found in European countries; our own ground is very different, so that it would only be in exceptional cases that we should find it advisable to adopt formations which were found suitable in South Africa. That the attacking force, however, will be obliged here also to adopt a much more extended formation than hitherto is, for me, an axiom.

If, then, we may expect that on the side both of the attack and of the defence the frontal extension of the company will be much greater than it has been up to now, the question arises whether the strength of our tactical unit is not at present much too great.

In my opinion, only an affirmative answer can be returned to this question, even though allowance be made for the fact that the full war strength will be much diminished at the end of a few weeks. In the English Army, in which the company numbers only 100 men, real leading on the part of the commanders of companies, became impossible when two sections were extended next to each other. Their front then covered 400 yards. In ground with much cover it would be impossible to oversee a troop with a much smaller extension of front than that; the command would of necessity pass from the company leader to the section leader, and sometimes even to the group leader.

That the same reason which led to the substitution of the company for the battalion, as the fighting unit, may lead to the adoption of a still smaller unit in place of the company, is, of course, obvious. The question is whether the time for the change is thought to have now come. The answer to the question depends on whether it is thought necessary, in face of modern weapons, to adopt a more extended order in action, than is at present adopted in European Armies. That is the deeply interesting question which my experiences in South Africa have led me to propose for your consideration.

I propose now to state briefly what influence, in my opinion, modern weapons are likely to exert upon the three arms: infantry, artillery, and cavalry.

As regards infantry, I need only say a few words, after what has gone before.

For the defender, whether in prepared positions or in *rencontre* actions, it is of the first importance to adopt every means of securing the advantages of invisibility. The attacker can secure a relative invisibility, by approximating the colour of his uniform as much as possible to that of the *terrain*. This method is, though not in the same measure, of importance also to the defender. Glittering objects, visible at a great distance, are not in place on the modern battle-field. The English officers received orders, after the first few actions, to leave their swords behind, and went into action with rifles. As this measure was adopted primarily with the object of lessening the danger of their serving as special targets, it must, it is hardly necessary to say, have somewhat damaged their prestige with the private soldier. It would have been better if the sword, whose unsuitability to the modern battle-field should have been obvious, had been given up in time of peace. By arming the officers, at any rate the subaltern officers, with the rifle, advantage may be taken of their skill as marksmen, to increase the fire-strength of their side. The defender must so arrange his supports and reserves that the reinforcement of his line can take place without betraying the position to the enemy. In open ground it may be necessary to place them in, or *immediately behind*, the firing line.

The reinforcement of a defensive position by troops in the rear is carried out with most difficulty, just before, and during, the final attack. The heavy rifle fire of the attacker, immediately before the attack, renders a wide zone in rear of the position insecure, while the still more vigorous artillery fire during the attack is also chiefly directed against the *terrain* behind the position.

The great extension of defensive positions, and, in general, of the whole fighting line, gives to mounted infantry, whether horsemen or cyclists, very great value as a reserve.

With regard to artillery, the following points may be noticed. As the improvements in the modern rifle tell chiefly in favour of the defence, the attacking force must seek an increase of its fire-strength, more than hitherto, in a powerful field artillery. Even if the defender declines an artillery duel, which will often be advisable, he should still be able, at critical moments, by the intervention of his own guns, to draw the artillery fire of the attacking force as much as possible away from the point of attack.

This is only possible if he possesses artillery at least as good as that of his opponent. A weaker artillery on the side of the defender can partially make up for its inferiority by thoroughly utilising the advantages of invisibility. The moral advantage, however, of being the weaker in artillery is very great. Powerful quick-firing ordnance is, therefore, an indispensable requirement for our Army.

If one may draw any conclusions from this war as to the character of a European action, it may be expected that it will be slow and long drawn out. Mobility of guns, therefore, must not be made the primary requirement. The Boers never complained of the lack of mobility of any of their artillery, though, very soon, not only the 12-centimetre Krupp howitzer but also the 15·5-centimetre Creusot gun, were adopted among their field ordnance. Captain Holmes Wilson, who has written a study of the work of the English artillery in

Natal, quotes the well-known saying that in time of peace the field artillerist calls for greater mobility in his guns, whereas, during or after a war, his demand is always for a weapon of greater power. The English, in this war, never felt any need for greater mobility of their guns; on the contrary they were seldom able to take full advantage of the mobility they possessed. The most valuable services of all were rendered them by the naval guns, 12 pounders drawn by ox teams.

A minimum mobility—to be determined in our case by those who have a good knowledge of our *terrain*, and the facilities they offer for the transport of field artillery—must, of course, be insisted on. That secured, it seems to me advisable to make one's aim in the construction of ordnance the securing of the greatest possible material effect from each shot.

The question whether with a view to securing invisibility, a more extended formation should not be adopted by the battery in many cases, say by its division into sections, is one well worthy of consideration. The division of fire-command must here be placed to the debit, the lessened visibility to the credit side of the account. In a duel between two batteries, the one divided into sections, and the other massed, the former can concentrate its fire, while the latter must divide its attentions between several different targets. In the massed battery the material and moral effect of the enemy's fire, even if only one part of the battery suffer loss, makes itself felt throughout the whole; with the battery divided into sections this is not the case.

Artillery fire, like that of small arms, produces a moral effect often much greater than one would expect from the actual damage caused. Only fire concerning which one feels certain that it cannot reach one, fails of moral effect, and not even this wholly, for artillery fire, especially the fire of common shell, is visible and audible at a great distance and thus excites a feeling of insecurity over a wide area; so that though the firing line, which is well covered and feels itself secure, may watch the falling of the projectiles with unconcern, those who are some distance in the rear and not so well covered, become uneasy, especially when the shells fall now here, now there, so that one cannot tell what point is being kept under fire.

These observations contain nothing new, but I have thought it advisable to make them, because I have so often heard the value of artillery fire estimated solely with reference to the material effect it was capable of producing, as though this were the only object to be kept in view in artillery construction and design. That it must be kept in view goes without saying, just as the rifleman must endeavour to hit his adversary; but the view that artillery fire is valueless when it misses its mark, is, as I can testify from personal experience, an entirely mistaken one. I can remember too well the nervous excitement caused by artillery fire in those exposed to it; how troops in close order would spring apart, and wide detours be made round any area on which projectiles were falling. This kind of influence was exercised especially by lyddite shells, and particularly after a few instances of great destruction by single projectiles had occurred. It was not only the Boers who dreaded shell fire, the English too were often brought to a standstill by a few cannon shots, and driven to seek cover.

That in many narratives other views are expressed concerning the moral effect of artillery fire on the Boers, I ascribe to the fact that when the English confined themselves to bombarding positions in which the Boers did not feel themselves obliged to await an attack, they would retire behind kopjes and calmly await the end of the bombardment. Again, even when entrenched on the level, with no sheltering kopje at hand, the flash from the gun would often warn them of the approach of a projectile, and they would quickly seek cover till the danger was past. In both of these cases, however, the feeling of invulnerability was present. It is thus that I explain the view held by many that the Boers soon grew accustomed to the enemy's artillery fire and did not fear it. I regard that view as an entirely mistaken one. Only a short time before my departure, General Botha assured me that it was only the enormous British superiority in artillery, and especially their lyddite shells (which, be it remembered, were hurled by the guns of longest range), that made the Boers so discouraged, and often have I heard it said: "Let the English only give us *fair play* and send away their guns, and they may bring double their present number of riflemen into the field; we will bring them to a standstill," and General Botha added on one occasion: "and in a week I would retake Pretoria."

Expressions of this kind enabled me to understand the enormous importance to the defender of being on equal terms with the attacker in the matter of artillery, while the fact that, in this war, the losses caused by artillery fire have been relatively very slight, notwithstanding an enormous expenditure of ammunition, has confirmed me in the opinion that artillery does not owe its great prestige *primarily* to its destructive capacity.

That this consideration does not lead me to the conclusion that artillery should adopt the routine practice of shooting off its ammunition at random, I need hardly say; but I do believe that in many cases the admissibility of the expenditure of ammunition should not be too anxiously measured by the chances of producing material effect, and that from a less carefully directed but rapidly delivered fire better results are often to be expected, than from fire delivered only after the most careful estimation of range and elevation.

As regards the kind of shell, my opinion is that common shell has far greater moral effect than shrapnel. That the latter, with a well-timed explosion, may do great damage, is, of course, beyond dispute. Our impression was, however, that the English shrapnel did little harm, and that the prestige of the British ordnance with the Boers was gained chiefly by common shell, lyddite and other.

The Boers possessed, as I have said, no cavalry. Only a few bodies of scouts carried out part of the duties generally devolving upon that arm. Cavalry engagements were unknown in this war. Sword and lance having been thrust so much into the background by the greatly increased fire effectiveness of the rifle, it is not to be wondered at that the importance of cavalry as an offensive arm should have seriously diminished. In the future a cavalry detachment well trained with the rifle, will probably often succeed in repulsing a superior force, and thus achieve a result which it could not have gained by ordinary cavalry tactics. This shows how important it is to give the cavalry soldier a good infantry training. Charges against infantry armed with the modern rifle, unless all the circumstances be exceptionally favourable, will hold out very little prospect of

success. A single section will easily beat off several squadrons, unless the attack is in the nature of a complete surprise.

The American attaché, himself a cavalry officer, reports as follows to his Government:—

"That dismounted fire action for cavalry is a necessary component of its success, I do not think there is a doubt, and our cavalry is the only one in the world thoroughly drilled and instructed in it. From conversation with the eight other attachés representing all the large Powers of the world, I was especially struck with the fact of how little serious attention had been given to this matter in the cavalry of other countries. My experience has convinced me that the day of large cavalry bodies meeting in a mêlée is past, and that cavalry using a long-range carbine, with bullet not under ·35 calibre, and instructed as ours is, quickly to dismount and use it, will defeat any opposing horsemen trying to get home with sabre or lance."

In reconnaissance work, too, which in a future war will probably be the most important duty left to cavalry, the rifle duel between opposing cavalry detachments will probably almost supersede the cavalry charge. In every direction, in fact, I have been impressed with the enormous importance to the cavalry soldier of infantry training. Should my views on this point find general acceptance, the cavalry soldier will have to accustom himself to regard his horse, not primarily as a means of offence whose value lies in its momentum when hurled against the enemy, but rather as a means of transport, to bring him to a position where he can use his rifle to advantage.

This war has demonstrated very clearly the great importance of the art of constructing field fortifications, and has led to the recognition of the shovel or spade as one of the most effective aids to success in action. Smokeless powder has given a very high value to concealment from view; where there is no time to make cover, concealment will often give to a position a high degree of security.

The answer to the question whether trenches shall be constructed in the border of or well in front of covered ground, depends on the circumstances of the case. In many cases the taking of a position in the border of such *terrain* will deserve the preference over the entrenching of one's force some hundred of yards in front of it, and especially when the position is not very strongly held. It is important that the reinforcement of the position should be able to be carried out unseen. It is probable that the enemy will not open fire on the occupied border, so long as there is nothing from which he can infer where his opponent's riflemen are posted. The slightest sign, however, may help him to detect their whereabouts, so that the defenders must, for their own safety's sake, avoid everything which might betray their presence. In the case of troops whose *moral* one is not quite sure of, choice will generally be in favour of taking up position in front of the borders. The nervous soldier will then find the best guarantee of security in his appointed position, for if he leaves it he will have to cross a wide space devoid of cover.

The Boers, as a rule, did not make long trenches, but built schanzes or made rifle-pits which afforded cover to only a few men. Between the separate schanzes and pits were wide intervals. In this way an extended position could be occupied with a minimum of labour, and there was the added advantage that a well-placed lyddite shell would only cause slight loss. Long trenches are, from this point of view, dangerous; the effect of a lyddite shell falling in a long trench

was felt at a considerable distance from the point of explosion. Short trenches have also this advantage over long ones, that their occupants can protect themselves better against slanting and enfilading fire.

The great disadvantage of several short trenches, as compared with one long one, is that inter-communication in the position is impossible, and leadership very difficult. If, however, one has been driven to the opinion that the exercise of leadership, both on account of the great extent of the positions held, and of the necessity for invisibility, will in every case be very difficult, and often quite impossible, this latter drawback will have less weight.

Mr. Sandberg, in an article in the *Militaire Gids*, says that the Boers had no discipline. On a point of this kind I naturally feel great diffidence in criticising any statement by General Botha's late secretary. At the same time, I do not think the expression is a correct one. There is a word missing: the Boers had no *military* discipline. To offer unconditional obedience to the orders of superiors is contrary to the Boer's passionate feeling for independence. This feeling left its mark on all their military institutions and regulations. The officers were elected for a term of years, after which they were re-eligible. The plan of campaign was always decided on in a council of war, in which every officer possessed the right, not only to take part in the discussion, but also to vote for or against the adoption of any given plan. The officers then consulted their burghers, who approved or condemned the plan. Only when general agreement was reached was the plan put into execution. If the assent of the burghers were not previously obtained, there was every likelihood of their refusing at the eleventh hour to take any part in carrying it out. A striking instance of this was the failure to attack the Platrand near Ladysmith, though an attack had been decided on, because a certain number of field cornetcies disapproved of the plan.

That, with such a system, there was no military discipline in the sense in which we have defined the term, is of course obvious; nevertheless, discipline in another sense the Boers did possess. To avoid any dispute as to the definition of terms I will explain my meaning An organisation of the size of the Boer fighting force could have effected nothing had there not existed a certain degree of respect for leaders, and readiness to obey, on the part of the burghers, and had they not felt that co-operation was impossible, where sub-ordination was *entirely* absent.

What, however, led them to a certain measure of subordination was not the fear of punishment, nor the habit of obedience, but simply a clear grasp of the fact that without obedience to the orders of superiors, no plan of campaign of any kind could be carried out.

Obedience to an order seemed to them more or less to detract from the dignity of a "free burgher." In the State artillery and the police it was otherwise, there orders *must* be carried out, and the uniform was evidence of the surrender of freedom. The artillerist was, so long as he wore the uniform, "not ashamed to obey" (*niet skaam om te gehoorsaam*). Special circumstances led to the laying aside of the uniform by part of the artillery during the war; in the case of the police the uniform was also abandoned by order of the Commandant. The latter, however, told me later that he much regretted the order, since, in consequence of it, discipline had seriously suffered.

In the judgment of European military men, however, it is impossible to rely in war on this "obedience based on free-will." It gives the superior no guarantee that he can always count on unconditional obedience. The history of this war, and the opinion of many of the Boer leaders, confirm this view. What can be attained with such a discipline as the Boers possessed, we have seen; and it is much, undoubtedly, and deserves, therefore, careful study. What, however, can *not* be attained owing to want of military discipline is also plainly to be seen. The absence of military discipline was severely felt, especially in the latter half of the war, and led General Botha to demand for the Army of the South African Republic, which was to be called into existence on the conclusion of peace, a two or three years' service with the colours. It also led, at the eleventh hour, in September, 1900, to the passing of a law entirely re-casting the constitution of the burgher force. The system of election of officers was abolished; they were, from that time onwards, appointed by authority, while pay was awarded to the fighting burghers. The burgher force was thus transformed into an Army. It would be very interesting to learn what were the results of this Army law. The question cannot, however, be answered until more accurate and trustworthy accounts of the period of guerilla warfare reach us, than are available at present.

Though we cannot yet form an accurate judgment concerning the working of the new law, the fact that it was enacted is of very great significance, seeing that it owed its existence to the pressure of circumstances, and must therefore be looked upon as the outcome of the experience of the Boer leaders.

We may conclude, then, that the necessity of military discipline became plain even to a people so contentious as the Boers.

Military discipline, however, is an expression whose meaning has become modified by time. Alteration in tactical formations, as also altered ways of regarding the rights and powers of authority, which the revolution spread abroad, are the causes of these changes of meaning.

That military discipline has accommodated itself in all countries to the new ways of looking at things, I should be sorry to affirm. I find the following passage, for instance, in the preface to the work of Lieut.-Colonel May, who fought on the English side:—

"A choice, far-reaching in its consequences, is now forced on us—we must either adhere to the system followed during the old dynastic wars in the comparatively small Armies of a bygone era, when men were more afraid to run away than to die; or we must substitute intelligence for blind obedience, and appeal to men's honour rather than to their fears. In a country as free in all respects as ours, the old-fashioned methods can never again be tried until a national catastrophe occur. We must therefore fall back on less well-tried methods, and trust that education may develop a sense of duty, and that self-reliance and self-respect may not at supreme moments prove to be incompatible with the abnegation of self."

We may infer from the foregoing that in the English Army the kind of discipline which prevails, or prevailed till lately, is one more suited to a former epoch. This is borne out by the complaints made by the author concerning the training of the English soldier. "How," says he, "can we expect our soldiers to be men in battle when we always treat them as children in barracks; when we start from the

assumption that they are incompetent dunderheads, and impress that view on them so constantly that they at last come to believe it themselves? In action you must put your trust in a sentry, on whose watchfulness the safety of a whole Army depends, and in barracks you trust the man so little that he may not put a cricket ground in order except under the superintendence of a corporal.

"Surely the man on whose watchfulness or intelligence as scout or sentry in war the security of a considerable force may rest, might, in peace-time, be allowed to try and roll a cricket ground unaided, or to drive a wagon containing coals a few hundred yards through an English country town!"

"In the Army," the complainer pursues, "when you want a man to do a thing you must invariably send another man to see him do it. The custom pervades the whole Service.

"The non-commissioned officer is continually superintending the private, the staff-sergeant the non-commissioned officer, the subaltern the staff-sergeant, the captain the subaltern, and so on through the hierarcy of command, each man's responsibility being mitigated at every step, and each man's independence and initiative being slowly sapped in the process."

If one opens any of the numerous English works on this war, one comes always upon the same complaint: lack of initiative, lack of individuality, lack of originating power in officers of all ranks. The intelligence was hemmed in between the lines of a manual which prescribed for the battle-field the tactics of the exercise ground.

Thus we find in Captain Holmes Wilson's book, from which we have already quoted, the complaint that the field artillery, placed in the course of the war in circumstances such as had not been foreseen by them, and in which the regulations of the drill book prescribed quite mistaken lines of action, were unable to form sounder conclusions for themselves on the field. "To abolish the system," says he, "to which our faith had been pinned would probably, at such a time, have done more harm than good. It was, of course, foreseen that the tactics employed by the enemy at Colenso would probably be repeated elsewhere on some future occasion. But even when confronted by this fact, how was a new artillery drill book to be written with which to face it then?"

Are we to infer from this complaint that the writer is of opinion that with the field artillery also tactics are too much governed by the drill book, in which speaks the spirit of the exercise ground; which prescribes stereotyped forms which have become through prolonged, often unintelligent practice, so much of a second nature, that they cannot be abandoned without great danger of utter confusion? I think we may conclude that is so, in view of the writer's statement in another part of his work, that it was of distinct advantage to the naval artillery, who served on land, that they were not, like their sister arm, the field artillery, bound by certain regulations which could not easily be put aside.

A training of this kind, in which the mechanical and unintelligent plays so large a part, is in complete accord with the older conception of discipline, which regards the soldier as a mere willing machine in the hands of his superior. It is plain, however, that from men thus converted into machines one cannot call for the insight and the self-reliance which the modern battle-field demands.

What was actually required of the field artillery? Simply that the batteries should be split up, and the guns disposed under good cover, in twos or threes, or even singly. This, however, says the writer, was not possible, as it had not been practised. Such an argument sounds strange, indeed, to one who watched the Boer artillery at work. They also were for the most part trained according to the Dutch artillery regulations, which are of many years' standing, and therefore not practised in the separate working of individual guns. Their training, however, had not destroyed in them the power of adapting their action to circumstances.

Two systems of training stood here opposed to one another. In the English Army a system of training and discipline, which acted as a paralysing agent on all ranks, and made the Army fit only to act according to stereotyped rules and formulas; in the case of their opponents—I allude here to the State artillery of the South African Republic—a method demanding obedience, but averse from all dead forms, and one which left abundant room for the initiative of the private soldier.

That the latter system is the preferable, who can doubt after recent experiences?

It may be objected that these experiences were not necessary to produce in us that conviction. It is true that since the last great European war the discipline which Lieut.-Colonel May calls that of the old dynastic Armies has been condemned by us in theory; that we understand how indispensable self-reliance and initiative are upon the battle-field, and that each new change of regulations bears evidence of that conviction. I would point out, however, that this war, fought with the new weapons, proves that a great further step in the same direction should be taken. Not only from the lowest officer, but also from the private soldier, a measure of insight and self-reliance must be demanded, which may enable him, in the most critical moments, to be "his own general." But this demands not only a very powerful, but also a very lofty kind of discipline, one whose basis is self-reliance gained by good individual training, and sustained by a strong feeling of duty and honour implanted by education.

Must barrack education lead to the kind of discipline I have condemned? Obviously not; though I cannot shut my eyes to the fact that prevailing conceptions and traditions are serious hindrances to the establishment of the kind of discipline the modern battle-field demands.

Besides, even if those hindrances could be swept at once out of the way, and barrack training be thus made capable of producing the ideal soldier, it is obvious that he cannot be produced by any training which lasts only a few months.

Therefore—convinced as I am that long service is for us out of the question—I am equally convinced that we must not look for the development of the right kind of military discipline, exclusively to barrack training, but that the latter must be the crowning point of an education, which, beginning in early youth, shall devote special attention to the development of feelings of duty and *esprit de corps*.

The events of this war constitute a powerful plea for the small, perfectly trained and appointed army, as against huge imperfectly trained masses of men. I do not mean by this to condemn the Militia Army, whose basis is universal service. The two most powerful factors which go to the formation of the trained soldier—marksmanship and

marching capacity—may be as highly developed in a Militia Army as in one of long service.

Whether a purely Militia Army is the best for any given people is, from the nature of the case, a *national* question, which cannot be decided by the experiences of a war between foreign countries. Of such experiences one can only demand that they shall bring some light, that they shall help us to recognise the present demands of war in general, and of the battle-field in particular.

I have already named the chief of those demands, and having concluded that marksmanship and marching capacity may be as well secured in a Militia Army, as in one with long service, the whole question of Army formation resolves itself into this: does a Militia Army meet also the third demand; can it guarantee a good and efficient military discipline? The South African war gives no complete answer to this question, the nature of the people choosing this type of Army is too important a factor in the case. It is no part of my plan to attempt here an answer to the question in respect of our own country. I may say, however, that that struggle offers both an encouragement and a warning to those who desire and prefer a Militia Army. It is encouraging to remember that the Boer forces, notwithstanding the absence of military discipline, accomplished much that we had regarded beforehand as impossible. It is an encouraging consideration, also, that no other people—not even our own—are by nature so averse to authority as the Boers.

On the other hand, the experiences of the war should warn us that neither patriotism nor enthusiasm for the cause for which one has taken up arms, has proved able to withstand and overcome the discouraging factors in the struggle. Discipline, trust in one's leaders and in one's own weapon, are the only things which will, in the long run, prevent the soldier turning his back on danger.

CAMPAIGNS AGAINST INDIA FROM THE WEST AND THROUGH AFGHÁNISTÁN.

Translated and condensed from the Russian of Major-General L. N. Soboleff, by Lieut.-Colonel W. E. GOWAN, Retired, Bengal Army.

(*Continued from January* JOURNAL, *p. 83.*)

IN the year 1688 A.D. there was born in the country of the Akhál-Teke, in a humble hut or felt tent of the Afshár Turkumáns, of the section of the Kirklu, an infant, who was soon to astonish the world by his military exploits.

We speak of the great army leader *Nádir-Sháh*, called by many "Nádir-Kuli-Beg."

Mirza-Mehdi, the historian of Nádir-Sháh's career, in his compilation entitled *Nádir-Náma*, or "The History of Nádir,"[1] tells us that the Afshár tribe, during the invasion of the Chingiz Mongols, had its camping ground in Turkistán, but, on being harassed by these Mongols, it transferred its quarters to the neighbourhood of Azerbiján, whence, during the reign of Sháh Ismail, it passed to the head-waters of the Maiáb-Kuhni-Káb stream, situated at a distance

[1] A translation of this work was made in 1770, and was published in London in French with this title, "Histoire de Nadir-Chah, connu sous le nom de Thahmás-Kuli-Kháŋ, Empereur de Perse. Traduite d'une manuscrit persan par ordre de sa Majesté le Roi de Dannemark. Avec des notes chronologiques, historiques, géographiques, et un traité sur le poése orientale. Par Mr. Jones, membre du college de l'université à Oxford."—*Author.*

It may be well to here add that Mr. James Fraser, who was a contemporary of Nádir-Sháh, compiled and published in 1742 A.D. the following work. He appears to have derived his information from Persian and other documents, written at the time of the several occurrences, and furnished by persons who were eye-witnesses of the events which they related. "The History of Nádir-Sháh, formerly called Thamas Kuli Khan, the present Emperor of Persia. (Pp. 71-234.) To which are prefixed, (*a*) A Short History of the Moghol Emperors of Hindostán, beginning with Timur. (Pp. 1 to 62.) (*b*) A Summary of the State of Affairs in India before the Persian invasion, showing the motives that induced Nádir-Sháh to undertake that expedition. (Pp. 63 to 70.)" The work also contains (*a*) an Index (pp. 235 to 239); (*b*) a Catalogue of about 200 Persian, Arabic, and Sanskrit manuscripts (pp. 1 to 40), collected by Mr. Fraser between 1730 and 1740 A.D.; (*c*) a Portrait of Nasr Ud-Din Mahommed-Sháh, Emperor of Hindostán, from an original drawing; (*d*) a Map of the Moghol Empire and Part of Tartary. London: 1742.—W.E.G.

of 20 *farsákhs*[1] to the north of Mashad (Meshed). Here, during the summer months, the tribe led a nomad life, but, when the winter set in, its tents or *Kibitkas* were set up in the mountainous country round Daragaz. Nádir was born whilst the tribe was in its summer quarters near the fort which was named after the stream or spring above mentioned. The date of his birth was the 28th of the month *Muharram*, 1100 A.H., corresponding with 1688 A.D., and he then received the names of *Nádir-Kuli-Beg*.

The warlike and predatory propensities of the Turkumáns developed in their youths uncommon boldness, and hence Nádir-Kuli, when a lad of only 15, surprised all by his unusual dauntlessness, and his many acts of daring gave every indication of his coming greatness. His figure too, even at that early age, showed that he would be a man of more than ordinary proportions.

From that period, and throughout his entire life, he scarcely ever left the saddle. Like Chingiz-Khán, Timur, and Bábar, he passed all the years of his childhood and youth in ceaseless striving after power. And yet, whilst subduing his many enemies, he frequently exposed himself to, and suffered, defeat. His own tribe of Turkumáns too often proved faithless to him, and he frequently became a fugitive. But he never lost heart, and always returned to the struggle with great determination.

In sketching the several outlines in the early life of Nádir, the same historian observes:—"There is no need to relate all the events which took place after the appearance of this planet (Nádir) of happy destiny, nor will we take upon ourselves to describe all that occurred at Daragaz, Abiverd, Mashad, and other adjacent places, relating to Nádir's struggles with the turbulent Afshárs, or with other tribes of Turkumáns, with the Kurds, Uzbaks, and other warlike races, nor will we dwell upon the commotions caused by his rivals in their efforts to bring about his destruction, or upon the methods adopted by this veritable hero to defeat all their attacks—methods which led at last to his bringing about a state of peace in those storm-swept and distracted countries. A mere superficial account of all such events would fill a huge roll of history, and would extend our labours far beyond the limits that we have marked out for ourselves."

Of course, Mirzi Mehdi, as the secretary of Nádir, must have been well acquainted with all the incidents of his master's early years, but in all probability during those years, so many things happened that seemed to him unsuitable for publication, that he, therefore, made no record of much that took place. Still one cannot but regret this hiatus in his narrative, for, in the earlier deeds of every great man, and certainly of every Army leader, there is often to be found the key of the enigma concerning the striking personality which is destined to make the history of the world. The well-known historian Malcolm tells us that Nádir, at the age of 17, was captured by the Uzbaks in one of their yearly inroads into Persian territory, and that it was not until four years afterwards, that he managed to effect his escape.[2] It was probably after this period then that Nádir himself

[1] Called also *farsang*, equal to about four English miles.—W.E.G.

[2] It is curious that neither Mirza Mehdi nor Mr. James Fraser should have made any mention of this incident. Moreover, in many other respects, the record of these three historians differs the one from the other.—W.E.G.

appeared at the head of a band of raiders, that he stopped caravans, levied blackmail on Persian villages and towns, and generally participated in those acts of violence for which his fellow-tribesmen were then and long afterwards so notorious.

Then we find him entrusted with some official post under the Persian Governor of Khurasán,[1] but in this position Nádir's bearing was so insubordinate that he was deprived of his rank, punished with the bastinado and turned out of the Persian service. He then fled to Kalát[2] where his uncle still held sway. Here, however, his stay was a short one, for his uncle could not brook his ambitious and unbridled disposition. Nádir then reverted to the position of chieftain of a robber-band.

Whilst yet a young man, he married a daughter of one of the elders of the Afshár tribe, who lived in the town of Abiverd, and on the 3rd (15th) February, 1718 A.D., a son, Riza-Kuli-Mirza, was born. Five years later, his wife having died, he married for the second time. By this marriage he had two other sons, Nasr-Ullah-Mirza and Imám-Kuli-Mirza.

We have already described in our "Introductory Remarks" the desperate condition into which Persia had fallen, after the Afghán conquest. In fact, she had at this time two claimants to the throne, one, Ashraf, the Afghán, in possession of the then capital of the country, Ispahán; the other, Tahmásp, the son of the deposed Sháh, Hussain, but he was for a long time a mere wanderer over the north-western portion of the Empire.

Then, again, Malik, who, as we have already seen, had raised the standard of revolt in the city of Tun, was at this time endeavouring to set up his independence at Mashad. And it was also at this period, that Nádir had considerably strengthened his position at Abiverd, Kalát and other adjacent localities. His historian indeed draws a vivid picture of those bloody exploits, whereby Nádir sought to establish his own authority over the freedom-loving, self-willed and licentious Turkumáns, and neighbouring ferocious tribesmen, and he tells us that it was only when Nádir perceived that destiny had precipitated Persia into the horrors of a general insurrection, that then, and not till then, did he himself uplift "the standard of authority" by rallying around him, Afshárs, Kurds, and other inhabitants of Abiverd, Daragaz, and Kalát, and by converting the last-mentioned point into an impregnable stronghold. To effect all this he had, as Malcolm reminds us, to murder his uncle with his own hands at Kalát.[3]

To Nádir's installation at Kalát, Mirza-Mehdi traces the beginning of his historical activity. No one, of course, really knows in whose name Nádir was trying to establish his authority over the northern frontier of Khurasán or what were the real sentiments he then had towards the lawful ruler of the Persian monarchy. But,

[1] Fraser says that he was appointed to the command of a troop of horse, and that he rose to be a *Mun Bashi*, or "commander of a thousand horse."—W.E.G.

[2] The famous natural stronghold, afterwards called *Kalát-i-Nadiri*. A good description of this place was given by the late Sir Charles McGregor. —W.E.G.

[3] Fraser gives another reason for this political murder; *q.v.*—W.E.G.

judging by all his undertakings, he himself well knew to what object he was striving. This much only is certain that Nádir in the first place used every effort towards the setting up of his power, over the borderland of the great Turkumán steppe and over the mountainous country which constitutes the frontier line of the rich province of Khurásán. He, so to speak, kept a firm grasp of this province, whence he could at any time throw himself southwards, whilst having in his rear the firmly held and almost inaccessible fortified places in a mountainous and well-wooded country. And, in the event of any severe reverse, he could always turn toward the steppe country and begin the work of recuperation afresh. In a word, he used every endeavour to secure both his rear and flanks and to so fortify his base as to make it possible for him to freely move forward as occasion required. In so doing, he displayed to a considerable degree the spirit of the highest political ambition, and he showed that he was far from being satisfied with the success to which he had already attained. Before him there opened out a wide field of activity and the adjacent province of Khurásán, which had completely fallen away from the central government of Persia, therefore appeared to him an enticing prize. It was in this direction then that Nádir first directed his path of conquest. But at the very time that he considered himself sufficiently strong to embark upon such a great undertaking, his adherents, who were always jealous of his successes, suddenly abandoned him. Certain of the chiefs of the Afshár tribe forsook him and either adopted a passively hostile attitude towards him, or openly went over to the side of Malik of Mashad. At the same time the Kurds refused to co-operate with him. His following thus became reduced to about 300 men. Nevertheless, so intrepid was he, and so accustomed to reverses of fortune that his spirit did not fail him, for with this handful of devoted followers he advanced to the capital of the province which he coveted, and his fame for so doing resounded throughout Khurásán. Malik, indeed, was so disconcerted by his sudden appearance that, on hearing of his approach, he sent an envoy with offers of alliance. Nádir well understood, however, that this attitude on the part of Malik was prompted by craftiness, and so he resolved to pay his rival back with the same turpitude. But first of all, he accepted the offer which Malik had made to him, and went to Mashad. He there paid to his new ally such deference that, to all appearance, they became great friends. But all the time Nádir had decided to lay hands upon his new "friend" and to kill him in public. After giving precise instructions to his retainers as to how they were to seize those followers who were about the person of Malik, he informed them that he would deal with his rival himself, and he arranged that the signal for making the onslaught would be the precise moment of his laying his hand upon the bridle of Malik's horse. Accordingly on a given occasion, whilst the two were riding together in the market place of Mashad, Nádir gave the preconcerted signal, but just at that moment the sun was shining so fiercely in Nádir's eyes that his hand over-shot the mark, whereupon those in the plot, perceiving the false stroke, did nothing towards carrying out their part of the arrangement, and Malik, who knew nothing of what was threatening him, rode on unconcernedly. This failure to put away his rival so enraged Nádir, that he decided to slay the two Afshár tribesmen who, as he considered, had deceived him. Having invited them to go with him outside the city under pretence of

seeking some sport, he attacked and ordered them to be killed. Thus it will be seen that this ambitious Turkumán was not over-fastidious in the methods he adopted for the attainment of his ultimate objects.

Nádir then returned to Abiverd, where he made up his mind to attack Malik in a more open manner. The murder of Nádir's two retainers so disturbed and terrified Malik that he made preparations to enter upon a conflict with his formerly secret but now declared enemy, and he sent an invitation to the Kurds to join forces with him. But they having refused, Malik placed himself at the head of a force numbering 6,000 men, and marched towards the capital of Kabushán. The Kurds were defeated and their city was captured. Nádir at once took advantage of this turn of events and, having gone over to the side of his recent enemies, fell upon Malik's line of communications and, after seizing a portion of his artillery and transport train, attacked his main body and compelled it to take refuge behind its entrenchments. The Kurds upon this flocked to Nádir's standards, and the next day Malik's force was utterly routed, but he himself managed to get back to Mashad. Nádir then returned towards Abiverd, because the inhabitants of that town had all at once gone over to the side of his rival. On the way he destroyed fort Neki-Kala with artillery fire and took it. He then invested fort Bahváda, but this was so strong that he had to resort to a regular siege, and under his personal and skilful directions *mining galleries* were constructed up to the base of the walls. And an explosion having been thus produced, a breach was made. Still the brave defenders of the fort refused admittance to their enemy, and, moreover, managed to close up the breach in the walls. Thereupon the resourceful Nádir ordered a wide and high rampart of earth to be thrown up against the defences, and on the top of this he caused to be dug out a channel, and along this he conducted the water from a mountain stream, which not only washed away the clay walls, but poured with great force into the interior of the fort. The defenders having then to surrender, he ordered their leaders to be executed, the fort to be destroyed, and the inhabitants to be deported to another part of the country. On arriving at Abiverd, Nádir learnt that the detachment, which he had sent to seize the fortified position at Zaagahand, had met with a reverse. He then went there himself, and not only soon gained possession of this point, but occupied Nissa as well. There then only remained in this direction the breaking up of the opposition of the many warlike tribes of Turkumáns, but they thought it more prudent to make a voluntary submission.

Meanwhile Sháh Tahmásp had sent against the rebellious Malik an army under the command of his general, Riza, and he, on the march towards Khurásán, heard nothing but reports as to the successes and the power of Nádir. It soon became evident to him, therefore, that, on the northern frontier of Persia, there had appeared a new and powerful person with whom he would certainly have to reckon. Hearing that Nádir intended marching to Kabushán, the Persian general, with a view of forestalling him, directed his troops against this town. But Nádir having received tidings of this move, swiftly changed his plan of operations, and marched in the direction of Mashad, thereby hoping to take possession of this town before the Persians could get there. Outside the walls of Mashad

he defeated Malik's forces, and then laid siege to the town. The inhabitants of the country round having come over to his side, Nádir's army was now a considerable one. Suddenly he received an intimation from the Persian general that, without his aid, he would never be able to possess himself of Mashad. This suggestive message was really sent to him, however, as an "order in the Sháh's name" to desist from his operations. The wily Turkumán did not consider it desirable at this juncture to disobey the Imperial command, and as in all probability he now had designs of turning the Sháh's weakness to his own advancement, he withdrew his forces to Hajitaráb, where he awaited the arrival of the Persian army.

Riza, having obtained the services of a Kurdish contingent, then marched against Mashad. Malik was not only glad that Nádir had withdrawn from the siege of his capital, but he was still more rejoiced that he now had as an opponent a general with whose incapacity he was already familiar. He therefore went out to meet him, but he had no sooner left the walls of Mashad behind him than the inhabitants rose in rebellion, and at the same time intimated to the Persian general that they had done so. Meanwhile Riza had sent his baggage train to Hajitaráb, where he calculated Nádir would now be. But the latter, considering that it would not be to his advantage to thus definitely co-operate with the Persian general, had withdrawn to Abiverd, thus leaving him alone to reckon with Malik. Riza's dispositions were now so faulty that not only did he fail in obtaining possession of Mashad, although its gates had been opened to him, but he gave himself over to defeat. He then had to retire upon Kabushán, where, after re-organising his forces, he once more advanced against Malik, but on this occasion he was completely routed. All this time Nádir was at a distance observing the tide of events. At length Sháh Tahmásp thought it expedient to supersede his incapable general, and to appoint in his place a Turkumán named Muhammad-Sháh.

Malik, after his victory over Riza, despatched his nephew to take possession of Nishapur, but the inhabitants, having no confidence in the forces of the Sháh to protect them, turned to Nádir for aid. At this crisis, however, it appeared to Nádir desirable to openly pose as the defender of the lawful government of the Sháh, and to add yet another token of obedience to that which he had already displayed in withdrawing from Mashad when desired to do so by the Persian general. He therefore collected a strong body of Turkumáns and Kurds, and having therewith defeated Malik's troops relieved Nishapur. But soon afterwards Malik himself once more appeared upon the scene, and, having scattered Nádir's band, for the second time occupied this town.

After this, Malik, Nádir's worthy rival, considered that the opportune moment had arrived for declaring his complete independence of Persia, and he accordingly ordered money to be coined in his name, and his title to be proclaimed as the independent ruler of Khurásán. And, indeed, for the time being, at any rate, his glory had completely eclipsed that of Nádir. The latter, however, could not brook the triumph of his sworn foe, who was now standing across the pathway of his own advancement, and so he once more advanced against him. An engagement took place close to Mashad, and this time Nádir was so completely defeated that he only just managed to get away safely to Kalát,

in the company of two adherents. His forces, moreover, were, for the third time, completely broken up. He had never reckoned upon such a disastrous defeat, and, to add to his misfortune, his fellow-tribesmen, hearing of his reverses, decided upon casting off his heavy yoke and upon taking possession of Abiverd. But this great army leader was not the man to sit quietly under such a state of things, so, after collecting all the men he could, he threw himself upon Abiverd, and, swooping down upon the rabble of recalcitrant Turkumáns, utterly destroyed it.

This was the position of affairs when Muhammad-Khán, the new Persian commander-in-chief, entered the province of Khurásán. Sending the governor of Nishapur to oppose the advance of the Imperial forces, Malik went with his own troops to occupy that town. The governor's troops being defeated, Nádir took a skilful advantage of the re-appearance of Persian troops upon the scene to make a dash at Mashad. Having encountered a force from this town near Jahánábád, he obtained a victory over them, and then continued his advance. Meanwhile Malik had concentrated his army about half a march from Mashad. In the fight, which subsequently took place, Nádir inflicted upon his foe a terrible defeat, capturing his artillery and baggage train, and scattering his troops. When the prisoners captured in this affair were brought to Nádir, he ordered all of them, who were inhabitants of Mashad, to be released, and then he set out for Kalát.

But Malik, who was a man of action and no dreamer, determined to upset the designs of his enemy, and to this end he despatched persons, in whom he could place confidence, to Kabushán and also to the Turkumáns, inviting them to join him in his opposition to Nádir. The forces of this coalition collected at Abiverd, whereupon Nádir, after a march of 25 *farsangs*[1] in 24 hours, swooped down and having defeated them, put to death many of his prisoners. And then, as is usual with a conqueror, having received an acquisition of strength, he marched rapidly on Mashad. Placing a considerable body of men in ambuscade, he led a body of 500 horsemen to fort Behár, close to the town of Mashad. Malik came out against these bold horsemen, and drove them before him, but they led him to the ambuscade, where an engagement took place. This was, however, indecisive, the weather being at the time most severe, for, in the heavy fall of rain, mingled with snow, Nádir could not bring up his guns, and so the opposing forces once more withdrew, Malik's to Mashad, and Nádir's to Abiverd.

Malik, whilst setting up his authority in Persian Khurásán, occupied himself to the same end in the *oasis* of Marv. But the specially deputed governor, whom he sent there for the purpose, managed, in the course of a three years' administration, to reduce the inhabitants to a state of desperation. Accordingly, they turned for assistance to the now famous Nádir, who at once responded to the call, knowing very well that the *oasis* of Marv, dominating as it does both Mashad and Herát,[2] would bring him great advantages, both in a political and

[1] See Note *ante*.—W.E.G.

[2] In this remark can be seen a reference to the Russian occupation of this very *oasis*, a step which naturally caused some uneasiness to students and others well acquainted with the importance of that acquisition. But this feeling was contemptuously described at the time as mere "Mervousness."—W.E.G.

military sense, could he but secure it. But when the forces, which Nádir had sent to the assistance of the Mervlians, reached the river Tajand, they were checked by a terrible overflow of that river. Meanwhile the inhabitants of Sarakhs decided upon offering opposition to Nádir's troops. Hearing of this, and not wishing to leave his flank open to a hostile attack, Nádir, observing the greatest secrecy, made a night march away from the swollen river, and directed his forces towards Sarakhs. The night was dark, and rain was pouring in torrents. Nádir's troops, however, continued their march on, although they had literally to grope their way along, but at length they were obliged to halt and wait for dawn. With the first rays of the sun they discovered that they were almost at the very walls of Sarakhs. Utterly taken by surprise, the inhabitants of this important place yielded without a struggle, and 3,000 of them were at once deported to Kalát and Abiverd.

Those who have attentively followed the course of events thus far will have perceived that by this time Nádir-Kuli had acquired a durable influence over the Turkumáns and Kurds, and that he had formed out of these warlike races efficient bodies of troops until, at last, he was able to conclude an alliance with the Khán of Khiva against his rival, Malik.

One false step, indeed, on the part of Malik, in the great game which he was playing for supremacy with a far cleverer man than himself, brought about a complete change of circumstances, and for this single false move he paid most dearly, as will be seen later on. Indeed, it may be said that this single false step carried him a long way towards his complete overthrow.

The fame of the triumphs of the renowned Turkumán had already reached the ears of Shir-Gházi, the Khán of Kharezm (Khiva), but it so happened that, at this very time, a Khivan caravan, on its way to Khurásán, had been plundered by Malik's orders. The Khán thereupon despatched a special envoy begging Nádir to avenge him for this pillage. The wily Turkumán, considering that an alliance with the Khán of Khiva would be a very good stroke of business, made much of the Khán's envoy, and recouped the merchants for the loss which they had sustained. A treaty of alliance was subsequently drawn up, and the result of this was that, in a very short time, 500 of the clever Khivan horsemen joined Nádir's standards. At this time Nádir was besieging Kurgán, the last bulwark of those of the Afshár tribe who were hostile to him, and almost simultaneously the Mervlians declared their allegiance to his cause.

These were, indeed, important successes for our hero, and the rumour of them spread far and wide through Persia, Turkistán, and the neighbouring States, until, at last, Sháh Tahmásp, who was in the province of Mazanderán, being greatly disturbed by all that he was hearing concerning this daring Turkumán, sent one of his ministers to the spot to inquire what sort of man he was, what following he had, and how far the rumours of his extraordinary successes against Malik were correct. This deputy reached Nádir just as he was engaged in the siege of Kurgán, but he nevertheless gave him and his escort a most honourable reception, and he also intimated to the envoy that it was his intention to see him safely on his way back through at least a portion of Khurásán. The Persians, who then made themselves acquainted with Nádir's forces and with the striking personality of

their commander, clearly understood that this leader was a man, with whom it would be much more expedient to be on friendly terms than to have as an enemy. And Nádir, on his side, reckoned that it would be incomparably more advantageous to him just then to stand openly on the side of the lawful Sháh of Persia than to be at enmity with him. And though he was well acquainted with the then terrible condition of Persian state affairs, he, whilst undoubtedly ever meditating on his own advancement and the attainment of that one object, chose for himself the part, for the time being, of the Sháh's ally. This choice was clever, not to say subtle; and after events justified its wisdom. From the walls of Kurgán, Nádir rode with his Khivan horsemen to the fort of Khurmand, which he captured, and immediately afterwards the garrison of Kurgán capitulated to him. From Kurgán Nádir marched to Marv, and offered to conclude a treaty of peace with the Yamúd Turkumáns, but as they would not agree to this, he attacked and destroyed their stronghold. And after entering into friendly relations with the Kájars, he deported all the Arabs of Marv to Abiverd. His army had by this time received a further accession of strength.

When Nádir set out for Marv, Malik, taking advantage of his absence, marched westwards to Lásh-Juvain with the intention of striking a blow at Sháh Tahmásp, who had joined his army that was operating at Sháhrud and in Khurásán. The Sháh thereupon sent to Nádir to ask for his assistance, and then, in order to avoid a collision with Malik's forces, moved towards Jhajarm and Isfarain. Meanwhile Malik, hearing that Nádir was advancing agreeably to the Sháh's request, towards Kabushán, gave up his immediate operations, and once more withdrew towards Mashad. But the Sháh's nobles, who were afraid of Nádir, desired to settle matters before his arrival, and accordingly the chief of the Kurds received orders from them to at once advance towards Mashad, and on his refusing to carry out such an absurd order, they caused him to be beheaded. The result of this was that the entire Kurdish tribe rose in rebellion. This insurrection embraced the whole of Persia as far as Astrábád, so that the operations of the Sháh's Army were at once paralysed. The Kurds, forgetting their old scores with Nádir, turned to him for assistance. Thus came it about that both disputants appealed to our hero for succour, and he immediately resolved to take advantage of the occasion. After an interview with representatives of the Kurdish tribe at Maiáb, having obtained from them an oath of fidelity to his cause, Nádir, in order to strengthen his new alliance, took to wife a daughter of the new Kurdish leader. Having done this, he dismissed the Imperial envoy, to whom he entrusted the following message to the Sháh and to his generals:—"Although it has been very indiscreet of you to stir up malice amongst the Imperial troops at a time when prudence dictated a conciliatory policy, and the encouragement amongst them of a spirit of zeal to overcome their enemy, nevertheless I, following the directions of Providence, will join the Imperial Army, and will bring back to it the Kurds, who have been guilty of disorder but who are now pacified." These words resounded with the stern declaration of a man having authority. The next day Nádir arrived at Kabushán and presented himself to the Sháh, and of course he came with his victorious troops.

This was the first meeting between Nádir-Kuli and Sháh Tahmásp. On the 7th (19th) September 1725 A.D., the united forces left Kabu-

shán *en route* to Mashad, and a demand from Nádir to Malik that he should surrender, having met with a refusal, the allied forces, on the 17th (29th) of the same month attacked the town.

It should here be mentioned that, previous to these events, the Commander-in-Chief of the Shah's troops was Fath 'Ali Khán Kájar, who had done so much to assist his master to establish his authority over Northern Persia. This man, when the Sháh was at Bostán, and when the news arrived of the Kurdish insurrection at Astrábád and of the near approach of the Afgháns, had asked the Sháh's permission to exempt from enrolment all the troops belonging to the Northern Provinces, on the ground that they might gather in the crops. The Sháh's Ministers, who desired the general's destruction, regarded this request on his part as an unpardonable offence, and the question as to what should be done to him was raised in the presence of the now all-powerful Nádir. The Sháh's Ministers demanded his execution, and Nádir, having been asked to give his opinion, observed that for such an offence, whilst a death penalty would be just, he thought that the general's incarceration in a fort would be a sufficient punishment, and he indicated Kalát as a suitable place because his own authority there was unlimited. In all probability Nádir, though very glad of the opportunity of getting rid of a man, who was to some extent blocking the way to his own advancement, was at the same time desirous of taking advantage of the opportunity of appearing to display his own magnanimity by trying to save his rival from death. But the crafty Sháh secretly ordered his general to be slain and his head to be brought to him, and then appointed Nádir in his place.

After this Nádir was not slow to take the reins of the Government of Persia into his own hands, to appoint his own adherents to the principal military posts, and to send his own nominee as Governor of Sabzawár. The siege of Mashad, interrupted by frequent skirmishes, continued for some time. And although Malik made one sortie in force, he was driven back into the city, whereupon many of his adherents deserted his cause. In short, Nádir appeared to be all-powerful, so that soon there came over to his side one of the principal partisans of the brave Malik, and he, after a conference with Nádir, arranged to seize the guard over one of the gateways and so allow of the entrance of the enemy. This was effected during the night of the 20th November (2nd December), 1725 A.D., when Nádir, at the head of 12,000 infantry, immediately rushed in and took the town. Malik then shut himself up in the citadel, which Nádir attacked on the following day. After some little delay, Malik surrendered, and was kindly received by his rival. He then abandoned the life of the world, and assumed the garb of a religious mendicant, and with Nádir's permission continued to live at Mashad.

Every step of his policy had been most carefully calculated by this far-seeing man. Thus, even before he had captured Mashad, Nádir had given a promise to cover with gold plates the roof of the tomb of the Imám,[1] which is held in such sanctity by all Persians, and when he was able to do so he fulfilled his promise, and the work was rapidly set in hand.

[1] The Imám Ali Riza—W.E.G.

(To be continued.)

NAVAL NOTES.

HOME.—The following are the principal appointments which have been made: Rear-Admiral J. Durnford, C.B., D.S.O., to be Commander-in-Chief on the Cape of Good Hope station. Captains—W. C. Pakenham to "Glory"; J. M. De Robeck to "Leander"; W. de Salis to "Juno"; H. P. Williams to "Hood." Commanders—J. R. Bridson to "Edinburgh"; W. H. Nicholson to "Ganges"; E. S. Alexander-Sinclair to "Surprise"; J. F. E. Green to "Caledonia"; R. M. Harbord to "Alacrity"; C. L. Vaughan-Lee to "Prometheus"; the Hon. G. A. Hardinge to "Phœbe"; R. F. Phillimore to "Mohawk"; H. D. Wilkin, D.S.O., to "Clio."

Rear-Admiral Angus Macleod hoisted his flag on the 1st inst. on board the second-class cruiser "Æolus," at Queenstown, as senior officer on the coast of Ireland in succession to Rear-Admiral E. Jeffreys, C.V.O. Rear-Admiral J. Durnford, C.B., D.S.O., who succeeds Rear-Admiral Sir A. Moore, K.C.B., C.M.G., as Commander-in-Chief on the Cape of Good Hope station, will hoist his flag on board the first-class cruiser "Crescent," which ship will relieve the first-class cruiser "Gibraltar" as flag-ship on the station. The new first-class armoured cruiser "Euryalus," which commissioned at Devonport on the 5th ult. to relieve the first-class cruiser "Royal Arthur" as flag-ship on the Australian station, left Plymouth on the 22nd ult. for her destination. The first-class battle-ships "Majestic" and "Magnificent" paid off at Portsmouth and Devonport respectively on the 1st inst., the officers and men turning over to the "Cæsar" and "Victorious," which commissioned on the following day. The first-class battle-ship "Resolution" commissioned at Devonport on the 5th ult., for the home fleet, where she takes the place of the "Sans Pareil." The second-class cruiser "Vindictive" paid off at Chatham on the 7th ult. from the Mediterranean, and the "Gladiator," a sister ship, also from the Mediterranean, arrived at Portsmouth on the same day, and will pay off at that port. The second-class cruiser "Leander" commissioned at Chatham on the 21st ult. for the Mediterranean, where she will serve as a torpedo-depôt ship. The second-class cruiser "Mersey" paid off at Chatham on the 25th ult., and her officers and men turned over to the second-class cruiser "Juno," which commissioned at Portsmouth on the following day.

The new first-class armoured cruiser "Roxburgh" was launched from the Greenock Foundry Company's Yard on the Clyde on the 19th ult.; she is one of the improved County class, full details of which were given in the Naval Notes in the JOURNAL for December, 1903. The new third-class cruiser "Diamond" was also launched from Messrs. Laird's Yard at Birkenhead on the 6th ult.; she is a sister ship to the "Amethyst," details of which also appeared in the JOURNAL for December, 1903.

New Ships.—The Admiralty have given directions for the laying down of the three new battle-ships of the 1903 programme; the new ships, which will be of the "King Edward VII." type, are to be named the "Britannia," "Africa," and "Hibernia," and will be built at Portsmouth, Chatham, and Plymouth dockyards respectively. They have also given out contracts for three of the new first-class armoured cruisers, which are to

be called the "Achilles," "Cochrane," and "Natal," and will be built by the Armstrong firm, Newcastle-on-Tyne; the Fairfield Shipbuilding Company, Govan, and the Vickers firm, Barrow, respectively. The "Warrior," the fourth, is to be built at Pembroke, and her keel plate has already been laid. All four vessels will be of the "Duke of Edinburgh" class, their dimensions being:—Length, 480 feet; beam, 73 feet 6 inches; displacement, 13,500 tons, with a mean draught of 27 feet. They will be protected by 6-inch armour, and the armament will consist of six 9·2-inch guns, ten 6-inch quick-firing, and twenty-eight smaller quick-firing guns. The engines are to develop 23,500-I.H.P., giving a speed of 22·3 knots.

The four new scouts, to be called the "Attentive," "Patrol," "Foresight," and "Skirmisher," are to be built by Messrs. Armstrong, Messrs. Laird, the Fairfield Shipbuilding Company, and Messrs. Vickers, respectively. The six new destroyers are to be built, three by Messrs. Hawthorne, Leslie and Co., of Newcastle-on-Tyne, and three by Messrs. Palmer and Co., at Jarrow-on-Tyne.

The Admiralty have decided to adopt Yarrow boilers for supplying steam for four-fifths of the power in each of the four new cruisers of 23,500-I.H.P., the remaining fifth of the boiler installation to consist of cylindrical boilers. The decision of the Admiralty to place the Yarrow boiler in vessels of this large power is a step in advance for the type of boiler with small diameter tubes, placed approximately in a vertical position; for, although the tubes in the new boilers will be rather larger than those in the so-called "express" boilers, such as are used in torpedo craft, and the thickness of the metal will, it is said, be greater, yet they will be considerably less in diameter than the tubes of the horizontal type, such as the Belleville, Babcock and Wilcox, or Niclausse boilers, hitherto generally fitted in the heavier-powered war-vessels.

Re-organisation of the Destroyer Flotillas.—An important order has been issued with regard to the torpedo-boat destroyers. The Admiralty have decided that, having regard to the fact that the destroyers on the home station will be under the command of the Commander-in-Chief of the Home fleet in time of war, it is considered desirable to give him a general control over them in time of peace. Their lordships have, therefore, approved of the following alterations being made in the organisation of the flotillas to take effect from the 1st January.

All destroyers in commission for service at home, except tenders to the gunnery and torpedo schools, will in future be under the command of the Commander-in-Chief of the Home fleet, and as soon as the necessary arrangements can be made, those in the Fleet Reserve will also be placed under his orders. The headquarters of the three flotillas will be Portland, with the "Invincible" as depôt-ship; Felixstowe, with the "Audacious" as depôt-ship; and Devonport, with the "Triumph" as depôt-ship, at which ports respectively the three ships will be berthed, and moorings for the destroyers in commission and reserve will be provided. On the completion of the "Invincible," at the end of January, she will be commissioned with the officers and men of the "Warrior," and will remain at Portsmouth until the destroyer-pen and the additional moorings at Portland are ready. The "Invincible" will then be transferred to Portland, which will become the base for the present Portsmouth flotilla. The post of inspecting-captain of torpedo-boat destroyers will be abolished, and a captain will be specially appointed for duty with the Home fleet destroyers. This officer, who will, for the sake of convenience, be designated Captain (D.) Home Fleet, will eventually be in command of the "Invincible"; but until that ship is ready he will be appointed to the command of the "Warrior," in

succession to Captain Erskine. A senior lieutenant or junior commander will be appointed to the "Invincible," to act as executive officer in all matters relating to the depôt and as assistant to the captain. The "Triumph" and "Audacious" will each be commanded by an officer junior to the officer commanding the respective flotillas, and they will, therefore, be senior lieutenants or junior commanders. The captain (D.) will have a small vessel at his disposal, in which he can accompany the flotillas to sea, if necessary, and visit the other depôts for purposes of inspection, etc. The torpedo-gun-boat "Grasshopper" will be detailed for this service, but will be replaced by the "Halcyon" when the refit of the latter vessel is completed in May, 1904, the crew of the "Grasshopper" turning over to her.

In order to give the captain (D.) and the officers commanding the flotilla the necessary disciplinary powers, the "Audacious" and the "Triumph," and all destroyers in commission, and also the "Grasshopper," will be made tenders to the "Warrior" as from January 1st, and transferred from the "Warrior" to the "Invincible" on the latter vessel commissioning as depôt-ship. As soon as the necessary arrangements can be made, the destroyers of the Fleet Reserve will be placed under the command of the Commander-in-Chief of the Home Fleet, and attached to the three depôt-ships, when the commanding officers of the depôt-ships at Felixstowe and Devonport and the second in command of the "Invincible" will be responsible for their efficiency. In cases where the staff of the depôt-ships are unable to cope with all the defects, and dockyard assistance is required, arrangements for these repairs, and also for the periodical half-yearly docking, are to be made between the flotilla commander and the Admiral-Superintendent of the port concerned, subject to any instructions which the former may have received from the Commander-in-Chief of the Home Fleet or from the captain (D.).—*Times* and *Naval and Military Record.*

Steam Trials of the "Libertad," now the "Triumph."—The new battle-ship "Libertad," which was built by Messrs. Vickers, Sons, and Maxim for the Chilian Navy, and has since been purchased by the Admiralty, and renamed the "Triumph," completed her official trials for acceptance by the Chilian Government in the early part of last December. On a six hours' trial, during which six runs were made over the measured mile, in the Firth of Clyde, she attained an Admiralty mean speed of 20·17 knots. The trials, which were attended by Admiral Simpson, Chief of the Chilian Naval Commission in London, along with the members of his staff, and by Mr T. E. Vickers, C.B., chairman of Messrs. Vickers, Sons and Maxim, lasted ten days and were of a searching character. The ship was loaded to her designed displacement with all her stores on board, 11,839 tons, her mean draught being 24 feet 7½ inches.

The first of the trials consisted of a series of progressive speed runs over the measured mile on the Clyde with the view of providing scientific *data*. The first run was at 12 knots, and it is interesting as a measure of the cost of power to state that three knots more, 15 knots, required a doubling of the engine power, while 17½ knots involved a further addition equal to over 80 per cent. The ship subsequently proceeded on her long distance trial, the duration and power being determined by Admiral Simpson. The ship continued right down the Irish Sea as far as the Bristol Channel at 17½ knots, and the admiral then expressed his complete satisfaction with the working of the machinery and discontinued the trial. For three hours more, however, the vessel was run at a speed of 19 knots. On the full-power trial, which was specified to be of six hours' duration,

the vessel steamed six times over the measured mile, and on none of the runs was the speed less than 19¼ knots, notwithstanding that the weather was stormy with frequent snow blizzards. The remarkable feature of this trial was the uniformity of revolutions of the engines, the variation being only 2 per cent., and it was found at the end of the six runs that the mean speed was 20·17 knots, with 158 revolutions of the machinery. This speed, of course, is in a large part due not only to the efficiency of the machinery but to the fine form of the ship, the absence of wave motion being specially notable, notwithstanding the fact that the ship has a beam of 71 feet with a length between perpendiculars of 436 feet. The coal consumption on the long-distance trial was 1·71 lbs. per I.H.P. per hour, and on the six hours' full-power trial 1·73 lbs. per I.H.P. per hour, so that the ship proved capable of a large radius of action, the bunker capacity being sufficient to take her at cruising speed to New York and back.

On the completion of the speed tests the vessel carried out a series of gun trials, which are exceptionally interesting in view of the heavy armament carried. She mounts four of Vickers's new 10-inch guns, two in the forward and two in the after barbettes, while on the upper deck there are four 7·5-inch guns in the casemates at the four corners of the main citadel, and on the main deck she has on each broadside five guns of the same calibre. She has also an exceptionally powerful auxiliary armament, including fourteen 14-pounders, four 6-pounders, on pedestal mountings, four of a new design of pom-pom, four Maxim rifle calibre guns, with two 12¼-pounders for service on land. The 7·5-inch guns, using 200-lb. shot, were fired, the velocity of these guns with nitro-cellulose powder being 3,000 feet per second, and they attained a rapidity of fire of eight rounds per minute. Tests were made of the supply of ammunition on board, and no difficulty was experienced in maintaining this high rate of firing. Several of the 7·5-inch guns were fired simultaneously in order to test the ship's structure, and there was absolutely no indication of weakness. The 10-inch guns were fired simultaneously and independently on various bearings to ascertain if any stress resulted to the structure of the ship; but a careful examination did not reveal even the breaking of light electric fittings, which sometimes occurs under less severe strain in modern ships. The 10-inch guns fire a projectile of 500 lbs. weight, with a muzzle velocity of 2,850 feet per second, using nitro-cellulose charges, while the velocity is somewhat less for cordite. All the operations of the 10-inch guns are by hydraulic machinery, the breech mechanism having an independent, yet simple, hydraulic device for opening and closing. The projectiles are raised from the magazine and rammed home in the guns and the guns are trained and elevated by hydraulic machinery. At the same time all these operations can, if necessary, be carried out by hand gear. In the case of the 7·5-inch guns on the broadside a new system of hydraulic machinery has been introduced for housing the guns, and this can be done in a few seconds, the guns being thus protected during heavy weather.—*Times.*

FRANCE.—The following are the principal appointments which have been made: Rear-Admiral — C. F. Antoine, to command of Cruiser Division of Mediterranean Fleet; Capitaines de Vaisseau—C. C. Guiberteau to "Sully"; V. F. Sauvan, to "Hoche"; Capitaines de Frégate—H. E. Rey to "Tempête"; P. J. Gouts to "Linois"; J. A. Chéron to command of Submarine Station at Toulon; J. Pradier to "Lahire"; L. G. Drouet to "Casabianca" and command of the *Défense-Mobile* in Tunis.—*Journal Officiel de la République Française.*

Rear-Admiral Antoine has been appointed to succeed Rear-Admiral Boutet in command of the Light or Cruiser Division of the Mediterranean Fleet, and hoisted his flag on board the first-class armoured cruiser "Pothuau" at Toulon on the 8th inst. Rear-Admiral Boutet struck his flag on the 16th ult.

The Case of the "Sully."—Urgent orders were received at Toulon in the middle of last month to hurry on the departure of the new first-class armoured cruiser "Sully," which was fitting out for service in China. Several delays, however, occurred, as the ship was not really fit to go to sea, and her commander, Capitaine de Vaisseau Farret, refused to report her ready, as one of her torpedo tubes and one of her propellers were defective, while her gun trials had not been completed. As the result, Captain Farret was summarily removed from the command, Captain Guiberteau being appointed in his place. The "Sully" eventually left for her destination on the 30th January, although it is known that there are several serious defects which must be made good when she arrives on her station.

Capitaine Farret appears to have since completely broken down mentally, and is now confined in hospital. Rightly or wrongly, a great deal of sympathy is felt for him, the *Temps* adding his name to the list of those who have been *brutally* removed by M. Pelletan, namely:—Vice-Admirals de Beaumont and Maréchal, Rear-Admiral Servan, Capitaines de Vaisseau De Lurgy, Dufayot de la Maisonneuve, and Duroch.

The Loss of the "Vienne."—The search for the missing transport "La Vienne," which left Rochefort for Toulon in December last, has proved unsuccessful, and the vessel is now given up as lost. Two cruisers, the "Galilée" and "Guichen," were employed to look for her. The former searched the coasts of Spain and Morocco, and as far west as the Azores; the latter the N.W. coast of France and the south and west coasts of Ireland. It is supposed now that the "Vienne" foundered in the Gulf of Gascony very soon after leaving port. According to the pilot who took her out of the Charente, the weather was very threatening at the time; so much so that he advised the captain to put back and wait till it moderated, which, however, he did not do. It is stated some ships' gratings have been found not far from the Pertuis, which, though not expressly marked as having belonged to the "Vienne," are nevertheless proved to be part of the upper deck equipment of some French man-of-war.

The *Temps* gives the following list of French vessels of war lost during the latter half of the 19th century, of which no traces have ever been found:—The "Sémillante," carrying 750 soldiers to the Crimea, lost in the Straits of Bonifacio in February, 1855; the aviso "Pandour," which left Valparaiso in 1848 and was never heard of; also the gun-boat "Etincelle," which disappeared in the Mozambique Channel; the aviso "Monge," which left Saigon for Japan in 1868; the corvette "Gorgone," which left Senegal for Brest in December, 1869; the aviso "Renard," lost between Obock and Aden: supposed to have foundered in a cyclone on 3rd or 4th June, 1885; torpedo-boat 110, which left Havre for Cherbourg on 21st March, 1889, and was never seen again.

The French Squadron in the Far East.—In the *Yacht* of the 30th January is an article on the strength of the French Squadron in the Far East, which is not calculated, in its opinion, to reassure public opinion in view of the existing state of affairs.

The naval force consists of three groups—namely, the Squadron of the Far East, the Reserve Division, and the vessels at the local stations of Cochin-China and Tongking. The first division of the first group alone

has any real fighting value. This first division is under the direct orders of a vice-admiral, the Commander-in-Chief in the Far East, and at present consists of two armoured cruisers, the "Montcalm" and "De Gueydon," while a sister ship, the "Sully," has just left Toulon to join them. The three together will carry six 7·6-inch, twenty-four 6·4-inch, and fourteen 3·9-inch guns. Three Japanese cruisers of the "Tokiwa" class, of the same age, displacement, and speed, carry almost double the weight of metal.

The second division consists of three protected cruisers — the first-class cruiser "Châteaurenault" (flag-ship of the rear-admiral), which resembles a large mail-boat, and is, although as fast, as badly provided with guns and protection as an auxiliary cruiser; and two second-class cruisers, the "Pascal" and "Bugeaud," of about 4,000 tons, whose original speed of 19 and 20 knots six years of service has reduced to 16 and 18 knots. In all the guns of the second division number ten 6·4-inch, two 5·4-inch, and fourteen 3·9-inch.

We do not take into account the three small gun-boats "Décidée," "Surprise," and "Comète"; for, on mobilisation, they would probably be paid off, and their crews, together with those of the gun-boats at the local stations, would probably be taken to complete the effectives of the Reserve Division. To "complete" is almost a term of irony, because, in reality, the Reserve crews do not exist. Always kept at a ridiculously low figure, the ravages of dysentery, fever, and other maladies of the murderous climate of Cochin-China, have reduced them to nothing.

The "Redoutable," "Vauban," "Achéron," and "Styx" compose the Reserve Division; an old ironclad with a central battery of modern guns, an ancient armoured cruiser, and two armoured gun-boats; all vessels without speed, ill-matched, and only fit for coast defence, in spite of some good qualities possessed by the first two on the list. The "Achéron" and "Styx" also have some sea-going qualities, and occasionally get as far as Cape St. James. Certainly, with no more than the reduced effectives available, the maintenance of the "Redoutable" and "Vauban" leaves much to be desired, and their mobilisation would be difficult. The local station of Cochin-China and Tongking have one modern vessel, the "Kersaint," between them. She is lightly armed, and has only a speed of 15 knots. There are also three sea-going wooden gun-boats, and a number of small river gun-boats.

Russia and Japan both possess in those waters a squadron as powerful as we maintain in the Mediterranean; England the same, all but two battle-ships, while Germany is about to build eight battle-ships specially for service in Eastern waters, where they will have Tsingtau as their base. The United States are also largely strengthening their Asiatic Squadron, which now consists of four battle-ships and four cruisers, while they are constructing a dockyard in the Bay of Subig, Luzon Island.

The single division of three armoured cruisers, ill-provided with gun-power, is not a force sufficient to protect the vast interests of France in the Far East, and, moreover, modern ships must have one or more fortified bases where they can refit, repair damages, and fill up rapidly with coal. Port Courbet possesses a good anchorage, but no arsenal or fortification. Saigon, recognised by M. Lockroy as a *point d'appui* in 1903, has been almost completely neglected by his two successors; while the number of officers on the establishment of this base for our fleet is quite insufficient. For keeping in repair eight large vessels, of which only the "Pascal" has a copper bottom, Saigon has only one dock; the second dock can only be used

for the despatch and small vessels; and this one dock is used also for merchant vessels. The coal depôt is badly placed; there are no proper facilities for coaling, and the quantity stored is insufficient. The workmen in the yard are Annamites, and there is a dearth of French overseers. In 1899 it was fondly imagined that the "Sully" could be built there, but, as a matter of fact, the dockyard has not the appliances for such heavy work; the utmost that can be done in the way of construction is to put together the torpedo-boats sent out from France in sections. The "Bugeaud" was six months in dock there, which shows how slowly the work is done, and we do not believe that even the repairs to the "Sully" can be properly carried out there. In the case of war with Japan, or England, the position of France in the Far East would be extremely critical.—*Le Yacht* and *Le Temps*.

JAPAN.—The strength of the fleet on the outbreak of war was as follows :—

First-class battle-ships — "Mikasa," "Hatsuse," "Asahi," "Shikishima," "Yashima," and "Fuji."

Second-class battle-ship—"Chin Yen."

Third-class battle-ship—"Fusoo."

First-class armoured cruisers — "Asama," "Tokiwa," "Idzumo," "Iwate," "Yakumo," "Adzuma," "Nysshin," and "Kasuga."

Protected cruisers (without gun protection)—"Chitose," "Kasagi," "Takasagi," "Yoshino," "Akashi," "Suma," "Akitsushima," "Idsumi," "Chiyoda," "Hashidate," "Itsukushima," "Matsushima," "Naniwa," and "Takachiho."

Torpedo avisos — "Tatsuta," "Chihaya," "Akasaki," with twenty 30-knot speed destroyers and sixty-eight sea-going and first and second-class torpedo-boats.

Of these ships the first four are improved "Majestics," but of slightly larger dimensions, being vessels of about 15,000 tons; the I.H.P. of the Japanese vessels, however, is nearly 3,000 greater, which has given them a speed of between 18 and 19 knots. The armament is almost identical with that carried now by the bulk of English battle-ships, except those of the latest type, viz., the "King Edward VII." and her sisters, and consists of four 12-inch guns in barbettes, one forward and one aft; fourteen 6-inch Q.F. guns in casemates (in the "Mikasa" there is a central armoured battery instead of casemates), with twenty 12-pounders and some smaller Q.F. and machine guns.

The "Yashima" and "Fuji" are somewhat smaller vessels, but they have a speed of 18·5 knots, and their armament is the same as far as the heavy guns are concerned; but they have four fewer 6-inch guns, and only sixteen 12-pounders instead of twenty. For practical purposes these six ships form an homogeneous squadron, and are, on the whole, superior in speed and slightly so in gun-power to any of the six out of the seven Russian battle-ships opposed to them. The second-class battle-ship "Chin-Yen" was taken from the Chinese during the war of 1894-95; she is a vessel of 7,350 tons; but has only a speed of 14·5 knots; she is fairly well protected, having a partial armoured belt of 14-inch compound armour, with 14-inch transverse bulkheads, while the redoubts and barbettes have 12-inch armour; her armament consists of four 12-inch guns, four 6-inch Q.F. guns, and some small Q.F. and machine guns. She is, however, no match for even the smallest of the Russian battle-ships, while the Russian

armoured cruiser "Gromoboi" would also probably make short work of her. The "Fusoo," the other ship mentioned, is for practical purposes of no fighting value.

The first-class armoured cruisers are a practically homogeneous squadron, vessels of 9,750 tons displacement, well protected, well armed, and possessing a high speed of from 21 to 22·5 knots. Their armour protection consists of a complete 7-foot deep water-line belt of hard Krupp steel, tapering at the bow and stern to 3·5 inches; above this is a citadel 250 feet long, protected by 5-inch armour with 3·5 inch transverse bulkheads, while the barbettes for the 8-inch guns and the casemates for the 6-inch guns are of 6-inch steel, with 3-inch ammunition tubes. They carry four 8-inch Q.F. guns in two barbette-turrets, with fourteen 6-inch Q.F. guns, twelve 12-pounder and some smaller Q.F. guns. Four of these ships were built at Elswick, one the "Yakumo" at the Vulcan Yard, Stettin, and the sixth, the "Adzuma," at St. Nazaire; but they were all built from the designs of Mr. Watts, the present Chief Instructor of the Navy, but at that time (1898) the head of the Construction Department of the Armstrong firm.

Of protected cruisers the Japanese possess 16, none of them, however, of more than 4,300 tons displacemnet; four of these, however, have a speed of from 22·5 to 23·5 knots; in addition there are 11 small unprotected cruisers. Her torpedo flotilla consists of three torpedo-gunvessels with a speed of 21 knots; twenty 30-knot destroyers, eleven torpilleurs de haute mer, and fifty-seven first and second-class torpedo boats, while under construction are five more torpilleurs de haute mer, about which no details are as yet forthcoming. The destroyers and first-class torpedo-boats carry three tubes, which fire the 18-inch torpedo, with an explosive charge of 171 lbs. of guncotton. The effective range of a Whitehead torpedo is now well over 2,000 yards, and its speed for the first 800 yards is 30 knots, after which it gradually decreases; it is kept on its course by means of a gyroscope, the action of which prevents deflection from the line of fire—an instrument which has now been brought to a great pitch of accuracy.

The "Nysshin" and "Kasuga." — The two new armoured cruisers "Nysshin" and "Kasuga," which have been purchased from the Argentine Government, were ordered early in 1902 from the firm of Messrs. G. Ansaldo & Co., of Sestri Ponente, by that Government when a strained state of affairs existed between the neighbouring Republics of Chili and Argentina. Japan decided to purchase the two Italian-built vessels in December last, and the work of completing and fitting them out was most expeditiously done, principally by the firm of Sir W. G. Armstrong, Whitworth & Co., who are responsible for the armament; they left for their destination on the 9th ult., arriving at Yokosuka on the 15th inst.

The two ships belong to what is now known as the "Garibaldi" class, the first of which was laid down for the Italian Government, but was bought for Argentina. The second was similarly purchased by the Spanish Navy, when trouble arose with America over the Cuban revolt. The third vessel, also laid down for Italy, was purchased by Argentina; but the fourth, the "Giuseppe Garibaldi," belongs now to the Italian Navy. Now the two Argentine ships have been bought for the Japanese Navy, so that of the six ships only one has ultimately been completed for the Navy for which she was laid down. Their dimensions are as follows :—

Length (extreme)	108·86 m.	(357 feet 2 inches)
„ between perpendiculars...	104·86 „	(344 „)
Total width	18·71 „	(61 „ 10½ inches)
Depth (moulded)	12·19 „	(40 „)

Draught aft	7·70 m. (25 feet 3·15 inches)
„ amidship	7·35 „ (24 „ 1·37 inches)
„ forward	7 „ (23 „)
Displacement on above draught ...	7,750 m.-tons (7,632 tons)
Full-power of machinery	13,500-I.H.P.
Designed speed	20 knots.
Total coal-carrying capacity ...	1,150 tons.
Radius of action at 10 knots speed	5,000 nautical miles.

The armour was manufactured at the Terni Steel Works, and has been hardened by the latest process. There is a central armoured redoubt, which extends for about half the length of the ship, the belt being 150 mm. (5·9 inches) thick at the sides, and the athwartship bulkhead plates 120 mm. (4·7 inches) thick. Forward and abaft the redoubt there is a belt extending 1½ metres above and below the water-line, of a thickness commencing with 150 mm. (5·9 inches), and diminishing to 80 mm. (3·1 inches) at the extreme ends. The armoured deck over the redoubt is formed of two plates, with a total thickness of 40 mm. (1·57 inches), and beyond this it is of 20 mm. (·787 inch) thickness.

The armament in the two new ships differs slightly. In one ship there is a single 10-inch gun mounted in the forward barbette, with two 8-inch guns in the aft barbette; while in the other vessel a pair of 8-inch guns are mounted both in the forward and aft barbette. Otherwise the armament is the same, and includes fourteen 6-inch guns protected by the citadel armour—five on each broadside on the main deck, and four mounted on the upper deck at the four corners of the citadel. There are four of these quick-firing guns to fire both fore and aft in line with the keel. There are also ten 3-inch guns, six 1·85-inch guns, two Maxims, and four torpedo-launching tubes in each ship. These tubes are above water and within the armoured citadel. There are two main magazines, situated directly under the fore and aft barbettes, and four for the secondary guns—two being in the centre of the vessel and one forward and one aft.

The propelling machinery is of 13,500-I.H.P., and has been constructed at Messrs. Ansaldo & Co.'s works at Sampierdarena, and is designed to give a maximum speed of 20 knots.

The electrical plant is considerably more powerful than has hitherto been fitted in vessels of this class, there being three large dynamos placed forward under the protective deck, and two others for general use on the upper deck amidships. The electrical current is used not only for lighting and search-light purposes, but for the training gear of guns, for night-sights, for firing the guns, for the ammunition hoists, for driving tools in the workshop, and for speed and direction indicators connected with the main engines.—*Engineering, and other sources.*

Russia.—The Russian fleet in the Far East at the outbreak of hostilities on the 8th inst. consisted of the following ships :—

First-class battle-ships — "Tsarevitch," "Retvisan," "Sevastopol," "Poltava," "Petropavlovsk," "Peresviet," and "Pobieda."

First-class armoured cruisers — "Gromoboi," "Bayan," "Rossia," "Rurik."

First-class protected cruisers — "Variag," "Askold," "Pallada," "Diana," "Bogatyr."

Third-class protected cruisers — "Boyarin," "Novik," "Rasboinik," "Djigit," "Zabiaka," "Vsadnik," "Haidamak."

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STEAD OF PORT ARTHUR.

SCALE.

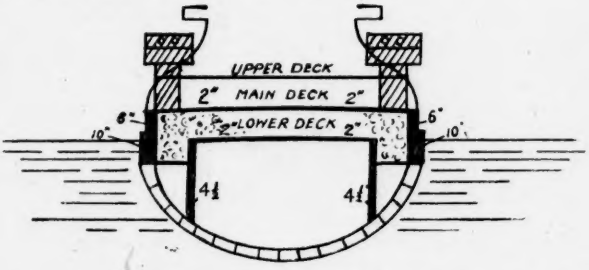
1 2 3 4 5 6 7 8 9 10

10 Cables = 1 Sea Mile.

Gun-vessels and gun-boats — "Giliak," "Gremiashchi," "Otvajny," "Koreëts," "Bobr," "Sivuch."

Destroyers—Probably sixteen, with thirty torpedo boats.

Of these ships, the "Tsarevitch" (13,110 tons), and the "Retvisan" (12,700 tons), are the first two to be completed of the 1898 Russian building programme, of which at various times so much has been heard. The "Retvisan" has been on the station some twelve months, the "Tsarevitch" has only recently arrived, having left Toulon on the 7th September last. Both ships were built at foreign yards, the "Retvisan" by Cramp, of Philadelphia, and the "Tsarevitch" at the La Seyne Works, near Toulon, and are extremely formidable vessels. The armour protection in both ships for both hull and guns is good, especially so in the "Tsarevitch," in which ship particular pains were taken to prevent the chances of serious damage from torpedo attack by bending the lower armoured deck, and carrying it down each side to the double bottom at the turn of the bilge, the thickness being increased on the curve and sides to 4 inches; this steel wall extends from the stem to just abaft the after magazine, and is one of the most notable features in her and her five sisters, still under construction or completing in the Baltic Yards.



The armament of the two ships is the same, viz., four 12-inch guns in pairs in barbettes, one forward, and one aft; twelve 6-inch Q.F. guns, in pairs in small turrets in the "Tsarevitch," and in a casemated battery in the "Retvisan," twenty 12-pounder Q.F. guns, and some smaller Q.F. and machine guns, with four torpedo discharges, two of which are submerged. Both ships have a speed of from 18 to 18·5 knots.

The "Poltava," "Sevastopol," and "Petropavlovsk" are three sister-ships of 10,950 tons displacement; laid down in 1892 at St. Petersburg, and launched two years and a half later. In armour protection they fall short as compared with the Japanese ships, their water-line belt of 15-inch Harveyized steel only extending for some 280 feet amidships, while the small redoubt above has only 4-inch armour. The turrets for the heavy guns are 10-inch, with 5-inch bases, and the casemates and small turrets for the secondary battery are also of 5-inch steel. Their armament, however, is a formidable one, comprising four 12-inch guns in two turrets, twelve 6-inch Q.F. guns, eight of which are carried in pairs in small turrets, and the other four in the casemate amidships, with twenty small Q.F. and machine guns. They have a nominal speed of 17 knots.

The "Peresviet" and "Pobieda" are vessels of 12,600 tons. Although sometimes classed as battle-ships, they are really rather formidable armoured cruisers. The "Pobieda" has a complete water-line belt of 9-inch Harveyized steel, tapering to 4 inches at the ends. In the "Peresviet" and "Ossliabya," the third ship of the class, the belt runs only for some two-

thirds of the length of the ship; there is a central casemated battery protected by 5-inch armour, while the turrets for the heavy guns are of 10-inch. The armament for their displacement is somewhat weak, as they only carry four 10-inch guns, ten 6-inch Q.F. guns, with twenty 12-pounder Q.F., and some twenty-six small Q.F. and machine guns. These ships have a speed of from 18 to 19 knots. One of their great defects unquestionably is that they are huge targets, with a very large area of unprotected side; the bases of the turrets for the 10-inch guns are also badly protected, and liable to be seriously damaged by the explosion of heavy shells beneath the projecting portions.

Coming to the armoured cruisers, only two—the "Gromoboi" and "Bayan"—are first-class vessels. The "Gromoboi" is a new ship of some 12,000 tons displacement, laid down in 1899, and has been in commission about a year. She is protected at the water-line for about two-thirds of her length by a 6-inch belt of hard nickel steel, above which, reaching to the upper deck, is a central battery some 100 feet in length, protected by 4-inch steel. The casemates for the guns in the battery are 6 inches in thickness. Her armament consists of four 8-inch Q.F. guns, one at each corner of the central battery, sixteen 6-inch Q.F. guns, twenty 12-pounder Q.F., and tweny-four small Q.F. and machine guns. She has a speed of 20 knots, with a coal capacity of 2,000 tons.

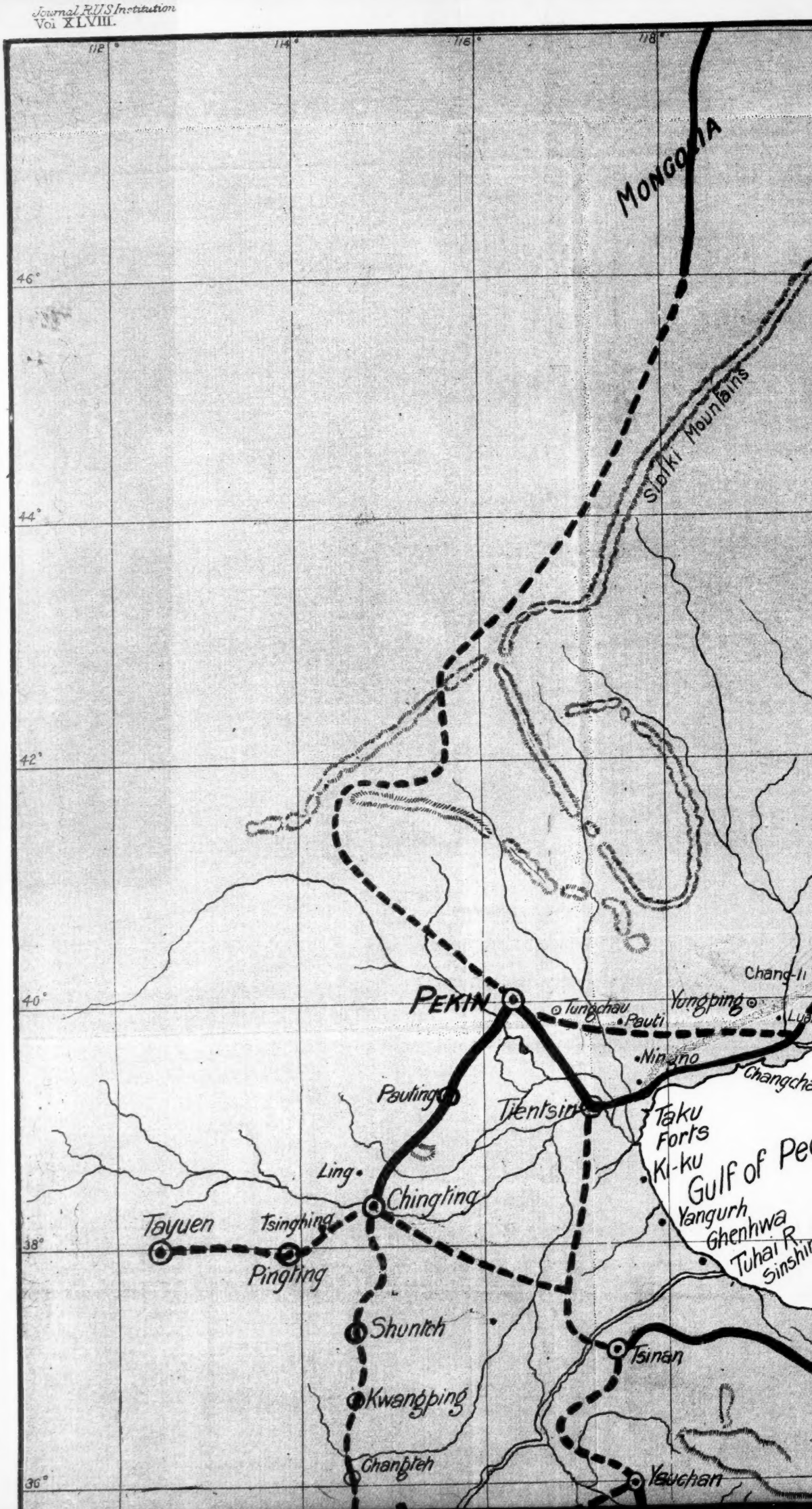
The "Bayan," also a new ship of 7,800 tons displacement, was built by the La Seyne Yard, near Toulon, and has only recently arrived on the station, having gone out in company with the "Tsarevitch." A full description of this ship appeared in the December No. of the JOURNAL, 1902.

The "Rossia" and "Rurik" are simply belted cruisers, and although they have a powerful armament, viz., four 8-inch and sixteen 6-inch Q.F. guns, with six 4·7-inch Q.F. guns in the "Rurik," and twelve 12-pounder Q.F. guns in the "Rossia," besides smaller guns; the guns are, however, without any protection, except the two forward 8-inch guns in the "Rossia," which are in casemates protected by 2-inch hard steel.

The first-class protected cruisers are all new ships, and fine vessels of their class, three of them, the "Variag," "Askold," and "Bogatyr," have a speed of 23 knots, and their 6-inch guns have a certain amount of protection with 3-inch armoured ammunition hoists.

There are no accurate details as to the number of destroyers and torpedo-boats Russia has in the Far East, as a good many have been sent out in sections and put together at Port Arthur and Vladivostok; but it is believed there are 16 destroyers and some 30 torpedo-boats, which are distributed between the two ports. Seven more destroyers, with six first-class torpedo-boats, are also on their way out, escorted by the "Ossliabya" and the cruisers "Aurora" and "Dmitri Donskoi." By the last accounts these ships appear to be still in the Red Sea, waiting orders, at anchor off Jebel Zukur, not far from Perim.

Diplomatic relations were broken off by Japan on the 6th inst., and hostilities commenced on the night of the 8th-9th by an attack by the Japanese torpedo flotilla, covered by a small squadron, on the Russian fleet, which was lying at anchor in the outer roads of Port Arthur, when the Japanese destroyers succeeded in torpedoing the battle-ships "Tsarevitch" and "Retvisan," with the cruiser "Pallada," the "Tsarevitch" having been struck aft, the "Retvisan" forward, and the "Pallada" amidships; it appears to have been found necessary to beach all three ships at first, but apparently, although reports are somewhat conflicting, they have all three since been brought into the inner harbour. It is doubtful if either of the battle-ships in their damaged condition can be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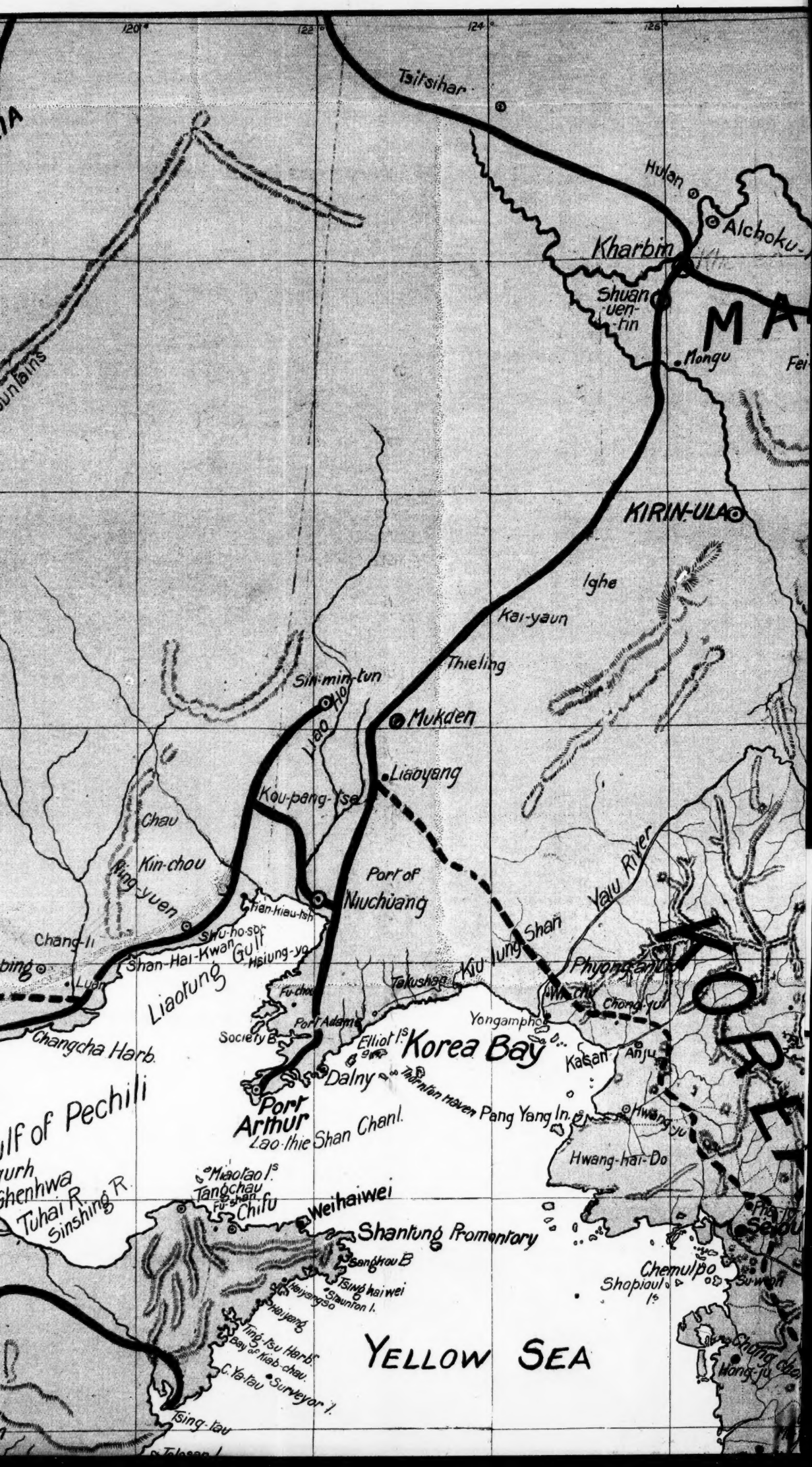
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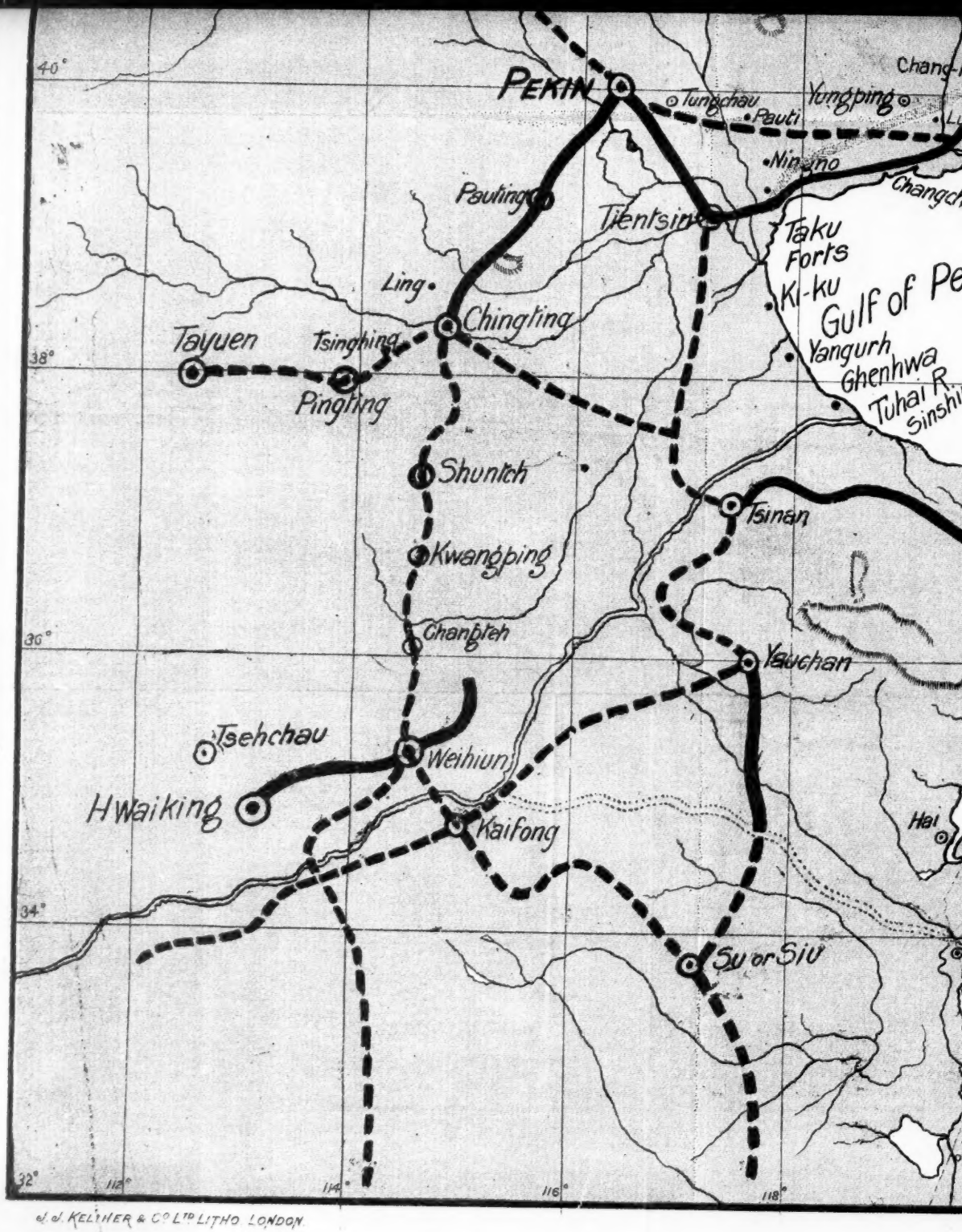

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Shan-Hai-Kwan
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Port Arthur
Lao-thie Shan Chanl.
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Amur B.
Usuei B.
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C. Povorotnoi
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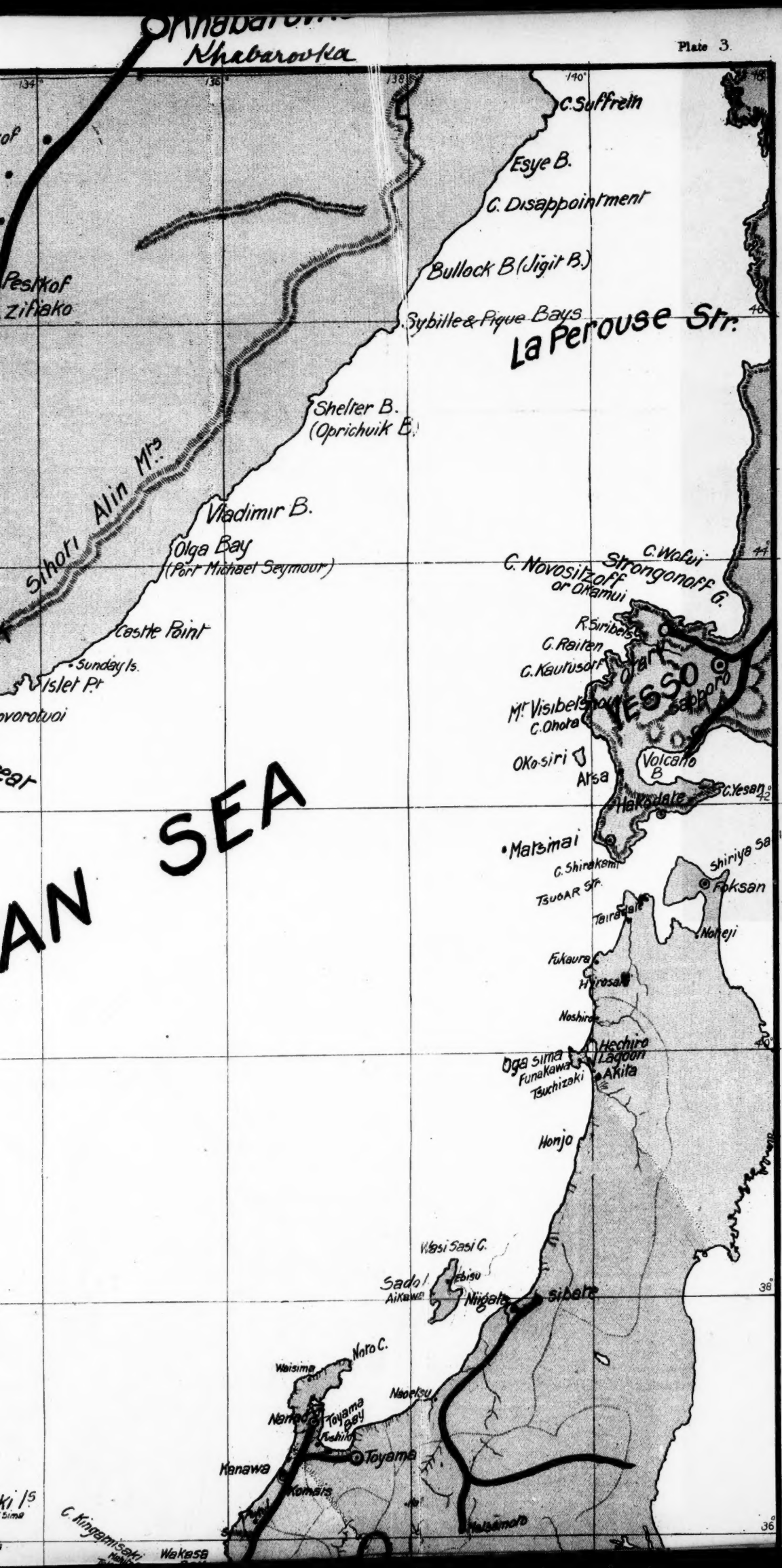
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La Perouse Str.
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Kanawa
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Maizuru
Hamamatsu
SEA

KOREA
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Chyung-Tyung
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Chang-heung
Masanpo
Fusan
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Tsu-shima
Fushu
Straits of Korea
Krusenstern Channel
Port Hamilton
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C. Goto
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Nagasaki
C. Nomo
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Firando Is.
Goro Is.
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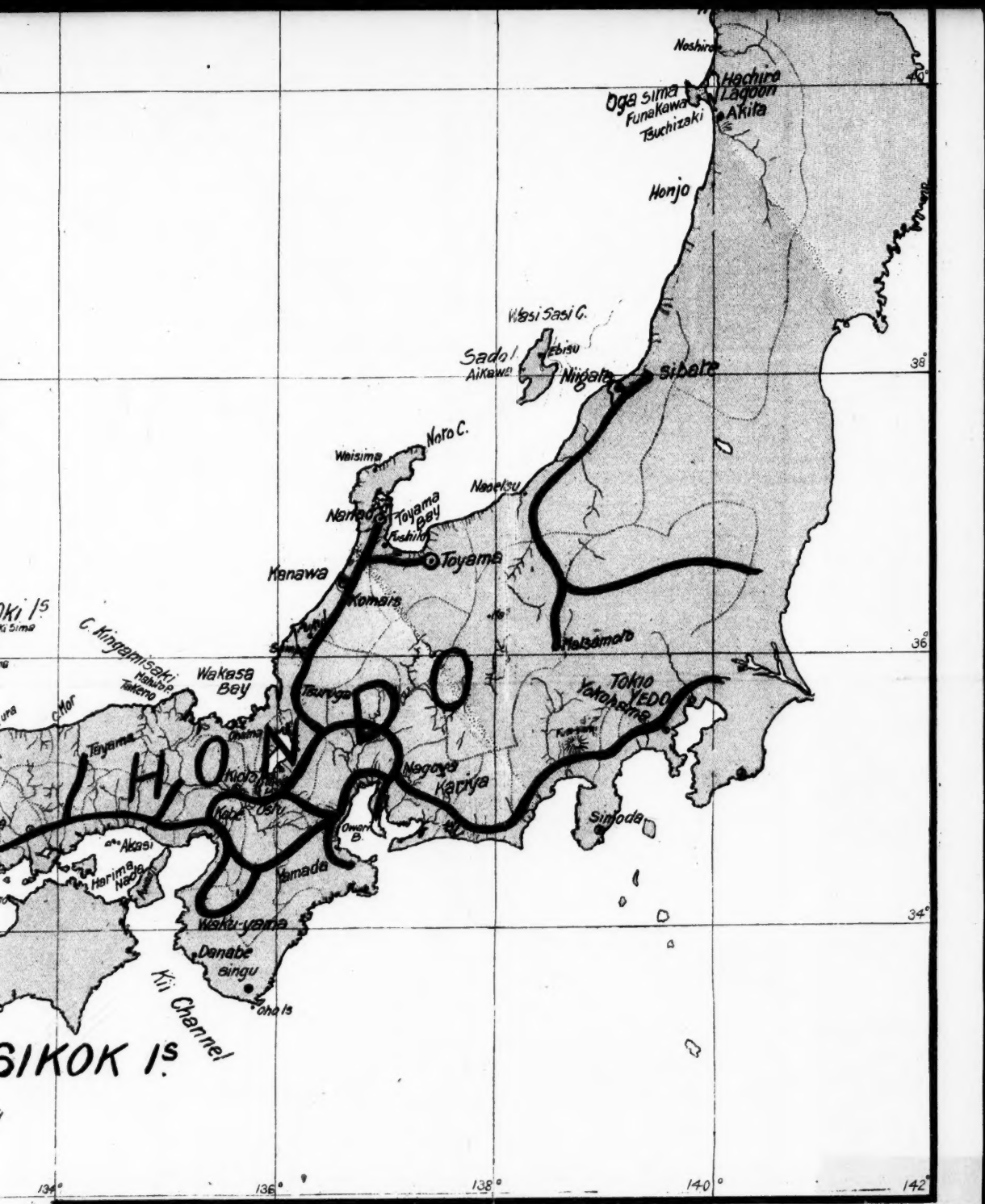

SCALE

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got into the one available dock at Port Arthur, or if the yard is sufficiently well-equipped to properly repair the serious damage which the ships have probably sustained. The next forenoon (the 9th inst.) the main Japanese fleet made an attack and appear to have damaged by their gun fire, more or less seriously, the "Poltava," with the "Askold," "Diana," and "Novik"; the "Askold" so seriously that according to the latest reports she has sunk. On the afternoon of the same day the "Variag" and "Koreëtz" were attacked and sunk off Chemulpho. On the 11th inst. a further disaster befell the Russians in Port Arthur by the accidental blowing up of the torpedo-depôt mining-ship "Yenisei," while attempting to secure a mine which had broken loose from the mine-field. Her captain and 96 men went down with the ship.

Whether the Russian fleet could have met the Japanese on fairly equal terms had the Port Arthur Squadron put to sea, instead of remaining at anchor in the exposed outer roadstead, it is now impossible to say. But the chances would all have been in favour of the homogeneous and powerful Japanese battle squadron. There have been rumours for several months past that the "Sevastopol" and her two sister ships were in an unsatisfactory state; it has been freely stated that the "Sevastopol's" turrets had sunk so perceptibly that there was a difficulty in working them, and it is certain that all three ships were to have been brought home as soon as they could have been relieved. It is further stated that although fresh from the builder's hands, the "Tsarevitch" had already developed many defects; among others, her ammunition hoists would not work properly, and workmen from the La Seyne Yard had followed the ship out to put things right.

Neither the "Rurik" nor the "Rossia" are in good condition; they have both been out on the station for some time, and are badly in want of repairs; like many Russian ships built in their own yards, it has been an open secret from the time of their arrival on the station that the work on board them had been scamped, the "Rossia's" bottom, in particular, when in dock, having shown decided signs of weakness. These two ships, with the "Gromoboi" and "Bogatyr," were, by the last accounts, at Vladivostok, and interest is naturally centred on their future movements.

MILITARY NOTES.

PRINCIPAL APPOINTMENTS AND PROMOTIONS FOR JANUARY, 1904.

Lieut.-Colonel and Brevet Colonel C. D. Cooper, C.B., from h.p. to be Colonel to command the 102nd Regimental District (the Royal Dublin Fusiliers). Major-General G. Henry, C.B., from Q.M.G. in India, to command a First Class District in India. Major-General Sir O'M. Creagh, V.C., K.C.B., to command a First Class District in India. Colonel (temporary Major-General) H. W. Duperier to be D.G. of Military Works in India. Lieut.-Colonel H. M. Sinclair, from R.E., to be A.Q.M.G., Western District, and is granted the substantive rank of Colonel in the Army. Major-General Sir E. Stedman, K.C.B., K.C.I.E., I.A., is granted the rank of Lieut.-General in the Army. Major-General J. S. Collins, from a Second Class District Commander, to be Inspector-General of Volunteers in India. Lieut.-Colonel

E. S. May, C.M.G., from a Professor at the Staff College, to be an A.A.G. at Headquarters. Lieut.-Colonel and Brevet Colonel T. E. Hickman, C.B., D.S.O., from h.p., to be a temporary Colonel on the Staff to command the Eastern Sub-District, Cape Colony. Colonel H. S. G. Miles, C.V.O., C.B., from Commandant, Staff College, to command the Troops in Cape Colony. Lieut.-Colonel and Colonel V. Hatton, C.B., from h.p., to command the Troops in South China. Lieut.-General Sir A. R. Badcock, K.C.B., C.S.I., I.A., to be General. Lieut.-Colonel and Brevet Colonel A. W. L. Bayly, C.B., D.S.O., A.D.C., I.A., from A.A.G. of a District, to be A.Q.M.G. at Headquarters in India, and is granted the substantive rank of Colonel in the Army. Lieut.-Colonel and Brevet Colonel H. M. Lawson, A.D.C., from R.E., to be Director of Works at Headquarters, and is granted the substantive rank of Colonel in the Army, and the temporary rank of Brigadier-General whilst so employed. Lieut.-General B. C. Russell, G.C.B., K.C.M.G., to be General. Colonel E. De Brath, C.I.E., I.A., is granted the rank of Major-General in the Army. Lieut.-Colonel and Brevet Colonel H. W. N. Guinness, C.B., from h.p., to be Colonel to command the 18th Regimental District (the Royal Irish Regiment).

HOME.—*Annual Report of the Inspector-General of Recruiting.*—The annual report of the Inspector-General of Recruiting (Major-General Sir Francis Howard) for the first nine months of the year 1903 has been issued as a Parliamentary paper. That the report is only for the first nine months of 1903 is owing to the decision of the Secretary of State that it should be rendered annually in future as from October 1st instead of January 1st. The alteration has been made so that the figures in the report shall include one complete trooping season in each report. The annual take of recruits for the several arms has for some years been arranged on the same basis.

The report is divided into four parts, viz. :—

1. General observations and recruiting for the Regular Army.
2. Army Reserve.
3. Militia and Reserve of Militia and Imperial Yeomanry.
4. Civil employment of discharged soldiers and reservists.

1. *General Observations and Recruiting for the Regular Army.*—The number of recruits raised for the Regular Army, excluding Colonial corps, for the nine months amounted to 29,324, and for the Militia to 25,744. These numbers show a large diminution on the numbers taken in the corresponding period of previous years. The falling-off, the Inspector-General states, is easily explained. At the beginning of the year, in consequence of the special recruiting for the mounted corps which had taken place during the war, practically all these corps were very largely in excess of establishment. The cavalry has, with one or two very slight exceptions, been closed to recruiting for the whole period covered by the report. The Royal Horse Artillery has been entirely closed, and the Royal Field Artillery has been closed for drivers, except in a few instances. The Royal Engineers were closed entirely in March, except for men of certain trades. The Army Service Corps has been closed, except for men for the new mechanical transport companies. The Royal Army Medical Corps has been closed entirely since 29th June, 1903.

A very important change was made with regard to the conduct of recruiting by a circular letter which was issued on 21st March. With the view of preventing the enlistment into the Regular Army and Militia of undesirable characters, instructions were issued to the effect that no recruit

was in future to be accepted who could not produce a satisfactory reference as to his character and antecedents. To avoid the possibility of recruits being lost to the Service while the necessary inquiries were being made, instructions were at the same time given that apparently desirable recruits could be attested, but were not to be finally approved until a satisfactory character was forthcoming. The immediate effect of the change was a considerable diminution in the number of men joining; but now that the system is in full working order, and is thoroughly understood and worked in a liberal spirit in all recruiting districts, practically no desirable men are lost to the Service. One difficulty which has arisen in connection with the working of the system is the prevention of the enlistment of recruits by means of false characters; but it is hoped that in the next Session of Parliament the necessary legislation may be passed to remove this obstacle.

In the Report of the preceding year reference was made to the new system of measuring recruits which had been in tentative operation in 1902, and was made permanent in January last. A modification was made in April by the abolition of the fixed standard of weight laid down in the several schedules. The weights therein laid down are considered not so much as a fixed standard, but rather as a guide indicating what is considered approximately to be the lowest weight consistent with health for a given age and height. In June last an Army Order was issued directing that every recruit shall, on completion of a gymnastic course and six months' service, be carefully re-measured as to height, chest measurement, and weight. It is intended to compile in future returns embodying the results thereby obtained. The question of the eyesight of intending recruits, it is mentioned, is under the consideration of a committee. The experiment made towards the end of 1901, under which recruits were allowed to be enlisted who were wearing false teeth, was found not to be working satisfactorily, and in January instructions were given cancelling the relaxation made. After dealing with the financial and other concessions made during the year, the general tendency of which is to improve the position of the soldier, the Inspector-General says :—

"Recruiting for gunners for the Royal Field Artillery has been satisfactory. In last year's report mention was made of the facilities afforded by the Irish Government to enable recruiting for the Irish Guards to be satisfactorily carried on in Ireland. A further concession has been made this year, and men of the regiment are now allowed to register their names as candidates for the Royal Irish Constabulary, provided they apply for registration not later than three months after enlistment. Recruiting for the Foot Guards has not been at all satisfactory during the period under review, probably for the reason given in last year's report. Recruiting for the infantry of the line has been more satisfactory, but the large increase in the totals is mainly due to the fact that the mounted corps have been closed, and that recruits wishing to enlist had practically only the infantry open to them. Recruiting for the Royal Garrison Regiment has shown a marked falling-off during the year. This is probably partly due to the fact that the married men belonging to the units must, in most cases, remain separated from their wives and families, owing to the insufficiency of married barrack accommodation at Malta and Gibraltar, and partly because the class from which these battalions are recruited is becoming exhausted."

The subjoined table shows the number of recruits enlisted during the first nine months of 1903 for the various arms of the Service, ex-soldiers re-enlisted for a minimum service of four years at home or abroad, and ex-soldiers who joined the Royal Garrison Regiment :—

Arms of the Service.	Ordinary Recruits.	Ex-soldiers re-enlisted under A.O. 106 of 1900.	Ex-soldiers re-enlisted under A.O. 59 of 1901 and 35 of 1903.	Total.
Household Cavalry	49	1	—	50
Cavalry of the Line	344	14	—	358
Royal Artillery { Horse and Field ...	2,416	6	—	2,422
Royal Artillery { Garrison	2,921	1	—	2,922
Royal Engineers	765	—	—	765
Foot Guards	1,144	—	—	1,144
Infantry of the Line	20,112	51	—	20,163
Royal Garrison Regiment ...	—	—	1,121	1,121
Colonial Corps	506	—	—	506
Army Service Corps	727	—	—	727
Army Ordnance Corps ...	131	—	—	131
Royal Army Medical Corps ...	715	2	—	717
Army Pay Corps	—	—	—	—
Army Post Office Corps ..	—	—	—	—
Total	29,830	75	1,121	31,026

Of the 31,026 recruits (including Royal Garrison Regiments, Colonial corps, and re-enlisted men) enlisted for the Army in the first nine months of 1903, 1,524 were for a term of twelve years' service with the colours; 27,556 for three years with the colours and nine in the Reserve, 244 for two years with the colours and ten in the Reserve, 75 were re-enlisted for one year, 1,121 were recruits for the Royal Garrison Regiment, and 506 were for Colonial corps. The percentage of recruits taken under standard in 1903 was 6·1, as compared with 16·2 in 1902 (when the new system of medical examination, under which the number of men specially enlisted has considerably decreased, was only in partial operation) 32·9 in 1901, 30·4 in 1900, and 34·3 in 1899. The number of Militiamen who joined the Army during the first nine months of 1903 was 11,870, as compared with 18,379 in the year 1902, 14,907 in 1901, 10,715 in 1900, and 13,518 in 1899. The number of recruits raised by the sergeant instructors of Volunteers and the Permanent Staff of the Yeomanry is: Army, 2,575; Militia, 1,521; as compared to: Army, 4,369; Militia, 3,174, for the whole year 1902.

The Inspector-General remarks it is very unsatisfactory to notice the considerable increase in the percentage of recruits rejected for various ailments—24·77, as against 22·46 in 1902—a percentage which is higher than it has been for nine years. The decrease in the percentage rejected for want of physical development (9·06, as against 9·76) is mainly due to the greater care exercised by recruiters, but is partly owing to the new standard of chest measurement. Sir Francis Howard says considerable difference of opinion continues to exist among medical officers as to the fitness or otherwise for the Service of men with deficient or defective teeth. Cases are constantly arising of men being rejected and discharged on these grounds on joining their units, although they have satisfied the previous requirements of the examining medical officer who passed them as fit for the Service. An interesting table furnished by the Director-General of the Army Medical Department shows the occupations and educational qualifications of the recruits medically inspected. From this it appears that 674 per 1,000 of those inspected were labourers, servants, husbandmen, etc.; 113 manufacturing artisans (as clothworkers, weavers, lacemakers, etc.); 113 mechanics employed in occupations favourable to physical development (as smiths, carpenters, masons, etc.); 51 shopmen and

clerks, eight professional occupations, students, etc.; and 41 boys under seventeen years of age; while 67 per 1,000 are described as well educated, 907 as able to read and write, fifteen as able to read only, and eleven as unable to read.

2. *Army Reserve.*—The following table shows the strength of the First Class Army Reserve during the past five years and nine months, and also the numbers belonging to the various arms of the Service, and to each of the four sections of the Reserve; the Reserve is gradually returning to a normal condition, and has increased by a net total of 33,606 since January 1st.

Date.	Arms of the Service.											Total strength.
	Cavalry.	Royal Artillery.	Royal Engineers	Foot Guards.	Infantry of the Line.	Army Serv. Corps.	Royal Army Medical Corps.	Army Ordnance Corps.	Army Post Office Corps.	Army Pay Corps.	Colonial Corps.	
1st Jan., 1899	5,961	10,843	3,058	5,394	49,523	2,620	932	210	111	23	123	78,798
„ 1900	3,255	3,837	1,178	1,323	13,907	1,205	16	15	4	7	110	24,130
„ 1901	496	1,238	261	349	2,670	275	8	5	1	4	103	5,251
„ 1902	285	927	243	237	342	206	8	5	42	1	102	2,398
„ 1903	2,028	4,881	1,559	3,904	18,656	1,278	328	55	43	8	125	32,865
1st Oct., 1903	5,599	7,841	2,657	5,790	40,403	2,488	1,095	130	198	17	253	66,471

The figures for 1900 are affected as regards all classes of the Reserve by the numbers recalled to the colours on mobilisation, viz., 54,320.

227 men who rejoined the colours in South Africa during 1899 are included in the "Arms of the Service," but not in the "Total strength."

3. *Militia and Reserve of the Militia and Imperial Yeomanry.*—As has been previously stated, the stipulation that recruits must produce satisfactory references was extended to the Militia as well as to the Regular Army. The total number of recruits enlisted for the nine months shows a very large falling-off as compared with the corresponding period for the previous five years. This regrettable decrease may perhaps partly be attributed to the formation of the Reserve for the Militia. Ex-soldiers and ex-militiamen who, prior to the formation of this Reserve enlisted or re-enlisted into the Militia, now obtain exactly the same bounty as the ordinary militiaman, without the obligation to come out for twenty-seven days' training at a busy time of the year. The falling-off is also attributable to the increased requirements as regards efficiency now demanded from the Militia, many more units performing their annual training in camps outside their own districts, and, to a certain extent, to the standard of height having been temporarily raised.

The strength of the Reserve on 1st October, 1903, was 5,052. To facilitate the entry of applicants into the Reserve of the Militia a circular was issued to general officers commanding authorising them to give authority to officers at out-stations to finally approve men for this Reserve where it was considered that this course would be beneficial to the public service. Instructions were also issued authorising travelling expenses of candidates to and from their homes.

Two tables here given (A) show the strength of the Militia on the 1st January, as compared with the ordinary establishment during the

last five years; and (B) the actual strength of each arm of the Militia on the 1st October, 1903, as compared with the establishment:—

TABLE A.

Date.	Non-commissioned officers and men (exclusive of the Permanent Staff).				
	Effective strength.	Establishment.	Wanting to complete.	Increase or decrease in the effective strength during the preceding 9 months.	
				Increase.	Decrease.
1st January, 1900	98,130 (*a*)	123,137	25,007	—	5,517 (*a*)
„ 1901	92,741 (*b*)	124,252	31,511	—	5,389 (*b*)
„ 1902	102,845 (*c*)	123,993	21,148	10,104	—
„ 1903	102,420	123,016	20,596	—	425
1st October, 1903	89,743	123,510	33,767	—	12,677

(*a*) Excluding 2,156 Militia Reservists called out on permanent service with line units in 1899.
(*b*) „ 10,981 „ „ „ „ „ „ 1900.
(*c*) „ 32 „ „ „ „ „ „ 1901.

TABLE B.

Arms of the Militia.	Non-commissioned officers and men (exclusive of the Permanent Staff).		
	Effective strength.	Establishment.	Wanting to complete
Royal Field Artillery	238	297	59
Royal Garrison Artillery	13,072	17,376	4,304
Engineers	2,049	2,331	282
Infantry...	73,643	102,332	28,689
Royal Army Medical Corps	744	1,174	433
Total	89,743	123,510	33,767
Embodied Militia included above ...	2	—	—

Four additional units of Imperial Yeomanry have been formed during the past year: two in Ireland, with headquarters at Belfast and Limerick respectively, and two in Scotland, one to be styled the Scottish Horse, with headquarters at Dunkeld, and the other Lovat's Scouts, with headquarters at Beauly. The recruiting areas for these corps have been definitely assigned to them. The number of recruits taken during the nine months of the year amounts to 7,009, as compared with 8,845 for the preceding twelve months. A table annexed to the Report shows the establishment and strength of the home Imperial Yeomanry on the 1st January, 1903, and the increase and decrease which has taken place during the nine months, from which it appears that the force has made a further net increase of 3,482.

4. *Civil Employment.*—The table below records the number who left the colours with characters entitling them to registration for civil employment. The total number is shown for whom employment was found by means of official registers, or the employment societies, and in departments under the War Office.

Deducting those whose characters are unclassified, it will be seen that 35,119 men returned to civil life during the year with satisfactory characters, and that 25,118 were either provided with employment or had situations to go to.

Number discharged or transferred to the Reserve with	"Exemplary" characters	4,346
	"Very good" characters	17,683
	"Good" characters	13,090
	Unclassified	14
	Total	35,133

Number of men for whom employment has been found	War Office Register (messengers, etc.)		263
	Regimental District Registers (affiliated to National Association)		6,182
	National Association (London office only)		1,592
	Pensioners' Employment Society		691
	Guards' Employment Society		130
	Departments under the War Office: Army Clothing Department	18	1,201
	Works and Barracks Department	60	
	Ordnance Factories	156	
	Barrack Wardens, Barrack Labourers	279	
	Army Ordnance Department	638	
	Clerks in War Office	50	
To these may be added	Men who are known to have themselves obtained employment		13,456
	Men whose situations were kept open for them		1,603
	General Total		25,118

Taking into consideration that these figures are only for nine months, and that trade in all directions has been very quiet during the period referred to, the Inspector-General is of opinion that the above results must be considered very satisfactory.

In his concluding remarks the Inspector-General says :—

"It was not to be expected that the high numbers of the three preceding years could be maintained after the termination of the war, and, as previously pointed out, the restrictions caused by the excesses in establishment have materially affected the recruiting totals. It is interesting to note that recruiting seems to attract annually only a given number of men to the Army. So long as the war pressure existed recruits joined the more attractive arms—*i.e.*, the cavalry and artillery—and the infantry suffered accordingly. With the cavalry closed, and recruiting for the artillery being maintained at a higher standard, the infantry has taken more recruits, but not enough for its requirements. This all tends to show that under present conditions, even with the prospective advantages obtained by the soldier after two years' service, there is still a want of elasticity in the recruiting market. The changes which have been made do not affect the recruit immediately on his enlistment, and it would, therefore, appear that their ultimate effect does not appeal to the civilian. A perusal of the annual reports of all the districts shows that officers commanding are, on the whole, satisfied with the physique of recruits, while practically all report that their behaviour at the depôts is generally satisfactory. The education in many cases is only described as fair. The Commander-in-Chief, who made an inspection in the autumn of all depôts in Scotland, stated that he was extremely pleased with the recruits seen at the several depôts, and that all officers commanding districts had reported that a better class of men was offering for enlistment. In the annual

report for 1902 attention was directed to the large number of recruits lost to the Service owing to their rejection on physical grounds. In the reports from the various districts particular stress has again been laid in several instances on the medical rejections, especially for teeth. It may well be that the experience of the South African war has directed the attention of medical officers more especially to this subject. The fact remains that the number of men medically rejected is still very large, and should be the subject of anxious consideration. . . . While it may be true that, taking into consideration improved hygienic conditions, the physique of the working classes is not actually deteriorating, it is of national importance to endeavour to discover by what means the present large number of medical rejections can be lessened or obviated in the future, especially when, as in the case of Manchester, the medical rejections amount to 49 per cent. All reports tend to show that the new scheme under which characters are required for all recruits, has had a beneficial effect. It is too soon yet to judge it by results, but it may be reasonably expected that the loss to the Service by desertion and discharge for misconduct will be lessened in future, while the entry into the Army of bad characters will be checked. With the knowledge that they will not have to habitually associate with men of low moral character in the barrack-rooms, it is hoped that a better class of recruit will be attracted to the Service in larger numbers."

AUSTRIA HUNGARY.—*Machine Gun Trials in the Army.*—In the course of the year 1903 two machine gun groups were put on trial in Austria-Hungary. Each of these groups consisted of two machine guns; one of them was attached to the 12th Hussar Regiment of the XIth Army Corps, at Lemberg; the other, destined for mountain warfare, was experimented on by the XVth Army Corps, at Sarajewo.

These two groups are armed with the Maxim-Nordenfelt Machine Gun, model 1889, constructed to take the Austrian infantry cartridges, model 1893, and has the same system as the German Machine Gun. The barrel is placed in a cylinder filled with water to cool it; the sight is graduated for distances of from 200 to 2,000 metres. In automatic firing the rapidity of fire can reach the rate of 500 shots a minute. The cartridges are fixed in bands, which each carry 250.

The machine gun meant for the cavalry is placed on a framework in the form of a sledge, which is laid on a hind carriage, which, different from the similar German carriage, has no seat for the gun detachment. The latter are, as a matter of fact, mounted. They, as well as the cadrés, are furnished by the 2nd Dragoon Regiment, the drivers coming from the Artillery. The effective of the group is:—

One lieutenant in command.
Four non-commissioned officers, two of whom are gunners.
Two judges of distance.
Ten gun detachments.
Four drivers.
Two horseholders.
Twenty-nine horses.

The two-wheeled hind carriage, which carries the machine gun on the march, is called the gun-carriage, and may be used as such during firing after it has been detached from the limber, which is also two-wheeled. The hind carriage, constructed as a gun-carriage, carries a trail and an aiming lever. The framework, in the form of a sledge, which carries the

machine gun, the muzzle to the rear, rests on box of the gun-carriage, to which it is fixed. The ammunition is enclosed in boxes, also in the form of sledges. Each box contains six bands of 250 cartridges each. There are three boxes on the gun-carriage, and the limber chest contains four. There are, in addition, two separate bands on the gun-carriage. The whole contain forty-four bands of 250 cartridges, or altogether 11,000 rounds. The ammunition boxes are carried, or dragged, by two men. The carriages have, in addition, a spare gun barrel, implements, and spare tools, etc. The limber of one of the machine guns carries an armourer's tool-chest; on the other is the band filler, which requires two men to work it. When it is necessary to use the machine gun, the framework sledge supporting it is detached from the hind carriage and either carried or dragged into firing position by two men, or by a horse. Aiming implements are fitted to the framework, which serves as a carriage to the machine gun; they are used for aiming on a fixed object. The machine gun is made independent of these implements when firing on a moving object, and aim is taken by means of two handles fixed in rear. There are no regulation model ammunition wagons; country carts are used for the transport supplementary ammunition. The training of the cavalry machine gun group commenced on the 1st May last. On the 7th August it went from Lemberg to Pluchuw, where it carried out its firing practice, from the 10th to the 20th August. From the latter place it was sent to take part in the Imperial manœuvres, at the conclusion of which it was broken up. Next year a fresh set of experiments will take place with a new gun-carriage. In spite of the limited time devoted to training, when firing on a moving object, represented by a half squadron on a target at 1,100 paces, the extraordinary result of 86 per cent. of hits to rounds fired was obtained.

The group of mountain machine guns at Sarajewo was served by infantry. All the *matériel* is carried by draft animals. For each machine gun, including its ammunition supply, four gunners, three muleteers, two beasts for carrying ammunition, and one for carrying the machine gun, are necessary. The total of each group consists of :—

One lieutenant in command.
Eleven non-commissioned officers and gunners.
Two judges of distance.
Two horses.
Nine draft animals, including those for food and baggage.
Nine muleteers.

The framework which carries the machine gun and serves as a gun-carriage is different from the cavalry machine gun sledge. It is in the form of a tripod, which can be taken to pieces, and carries the aiming implements for elevation and direction. The length of the legs of the tripod varies; on the rear leg, which is the longest, a seat is fixed for the man who aims. The machine gun can also be carried on a man's back in country impassable for animals by means of a large hook, in a similar manner to Swiss machine guns.

There are three sorts of fire—viz. : 1, volley; 2, individual; 3, single shots—to be used against patrols and scouts, and which do not betray the position of the gun. All the drill regulations are of great interest, and are similar to the German. The cavalry machine-gun group must conform to all the various paces of cavalry; the mountain group only manœuvres at the walk.

Tactical Employment of Machine Guns.—The information contained in the provisional instructions with regard to the tactical employment of

machine guns are analogous to those of the German regulations. At the same time, they are more especially drawn up with a view to mountain warfare, or to co-operation with cavalry, and the trials were conducted in this sense. The machine gun is intended to develop a density of fire superior to that of infantry in confined spaces, defiles, lines of communication, etc.; in a word, under the conditions which are characteristic of mountain warfare. Its efficacy is unequalled against objectives showing depth, such as columns on the march, or deep lines taken in flank. It can never replace artillery at long distances, but as regards short and medium ranges, it will be a most useful adjunct to the other arms, especially with regard to the effect of surprise which it is capable of producing. On account of its enormous expenditure of ammunition the machine gun cannot keep up a prolonged action. For the same reason it should never fire on thin or sheltered lines of skirmishers. When firing on cavalry the fire should be distributed along the whole front of the attacking line, without neglecting the lines in rear. Supervision of the teams and of the flanks of the position occupied should be the object of its constant care. When opposed to hostile artillery, it should endeavour to approach it as near as possible. Hostile machine guns form a difficult object to hit, and they should be left to other arms to be dealt with. When the machine gun group is not brigaded with other troops, it is essential to attach a support to it, especially if the nature of the country renders observation difficult. It is especially with regard to this question of support that the Austro-Hungarian instructions differ especially from the German regulations. The latter provide no special support, except when the country is particularly close. The group should never be split up, for a single machine gun is without defence should it suffer any damage.

The command of machine gun groups demands special qualities of activity and initiative. The position to be occupied should, above all, furnish a good field of fire, the care of protecting it only coming later. A minute reconnaissance of the battery position and its approaches should first be carried out, as far as possible, and precautions taken to guard against surprise, and not to prematurely attract the attention of the enemy. To operate under cover, and to act so as to surprise is the ideal to be sought. The general mission and the object to be attained are pointed out by the commander of the troops; the choice of position, the opening, and the nature of the fire to be employed are left to the group commander. Ammunition should be freely expended if the result to be attained demands it; it should never fire over its own troops except under conditions when this sort of fire would be permissible to infantry itself. If an action is foreseen, it would be advantageous to place machine guns with the advance guard, even in cavalry divisions, so that they may occupy important points, etc., in time. As soon as sufficient forces arrive, the machine guns will be withdrawn from the firing line, and placed in reserve. Should the enemy be found already deployed, machine guns will not be brought into action, but be kept in the rear as a very mobile reserve which could be readily brought to that point where a decisive result is desired. The same principle will be followed on the defensive; machine guns will be used to reinforce threatened points, or to participate in counter-attacks. This rule is, at the same time, not absolute; if it is necessary to direct fire on the approaches to the position, or for other reasons, machine guns may be employed at the commencement of a defensive action.

In mountain warfare, where movements are difficult and often impracticable when once the action has begun, it will frequently be absolutely

necessary to advance machine guns to positions decided on beforehand. It will be advantageous to dispose them in front of the line of defence, or on its flanks, in order that they may direct their fire on the ground on which it is thought the hostile artillery will take up its position, with the object of surprising them, or for the purpose of flanking dead angles; in these cases all possible precautions must be taken to secure their own line of retreat.

Cavalry, when scouting, will employ machine guns for the purpose of breaking down opposition, especially in the storming of occupied localities. In cavalry actions machine guns will be taken as early as possible to such points where they may be able to support the attack up to the last moment. They should march with the advance guard at the head of the main body, select the battery positions in advance, and on the flanks, with a view to being able to act up to the moment of impact of the two hostile lines; they will guard at the same time against a possible enveloping attack on the flank they occupy. Change of position during a cavalry engagement must not be thought of, as the action develops too rapidly. It is under such circumstances that the group commander should, above all, give proof of initiative, and not await orders for the purpose of acting in the best possible manner under the circumstances. Should the enemy be driven off, he should at once vigorously pursue him, and prevent him from reforming; should the enemy be victorious, he must immediately decide whether it is better to defend himself on the position he has taken up, or to attempt to fall back on one in rear. Thanks to the presence of machine guns, cavalry operating with other arms will find a field for activity even on ground not suitable to its action. It will succeed in intervening in all phases of the battle; will check hostile advance guards, protect the deployment, guard against enveloping movements, and participate in the decisive attack. These new engines will, under many circumstances, take the place of cavalry dismounted action. They will lend a powerful aid to cavalry in the pursuit, for bold enterprises on the flanks, and will enable it, at the same time, to cover its own retreat.—*Revue Militaire.*

NAVAL AND MILITARY CALENDAR.

JANUARY, 1904.

1st	(F.)	H.M.S. "King Alfred" left Portsmouth for China.
3rd	(S.)	H.M.S. "Argonaut" arrived at Plymouth.
5th	(T.)	H.M.S. "Euryalus" commissioned at Devonport for Australia.
,,	,,	H.M.S. "Resolution" commissioned at Devonport for Home Fleet.
,,	,,	Japanese Government prohibited the publication of military and naval movements.
6th	(W.)	Launch of third-class cruiser "Diamond" from Messrs. Laird's Yard, at Birkenhead.
,,	,,	Russian reply to Japan was delivered.
7th	(Th.)	H.M.S. "Vindictive" paid off at Chatham from Mediterranean.
,,	,,	H.M.S. "Gladiator" arrived at Portsmouth from Mediterranean.
11th	(M.)	General Egerton attacked the Mullah's forces at Jidballi and defeated them. Enemy lost about 1,200 killed and 215 prisoners. British loss 25 killed and 14 wounded.

12th (T.) 3rd Bn. Lancashire Fusiliers arrived in South Africa from Bermuda in the "Dunera."
" " 1st Brigade R.H.A. } Arrived in South Africa from
" " 16th Brigade R.F.A. } England in the "Assaye."
" " Japanese Government decided to return Russia's reply for re-consideration.
13th (W.) The British Thibetian Expedition arrived at Tuna.
17th (S.) Major Kenna, V.C., surprised Karias of Aligheri, near Eilinaade, Somaliland, and killed 50 spearmen and captured 3,000 camels many thousand sheep.
19th (T.) Launch of first-class cruiser "Roxburgh" from the Greenock Foundry Company's Yard.
" " 83rd Co. R.G.A. arrived at Hong Kong from Esquimault, viâ Vancouver, in the "Empress of India."
" " 19th Hussars left South Africa for England in the "Dunera."
" " Colonel Younghusband met with an insolent reception from Thibetians at Guru.
21st (Th.) H.M.S. "Leander" commissioned at Chatham for Mediterranean as torpedo-depôt ship.
22nd (F.) R. and T. Batts. R.H.A. } Left South Africa for India and
" " 7th Brigade R.F.A. } Mauritius in the "Assaye."
" " 56th and 57th Cos. R.G.A. }
24th (S.) H.M.S. "Euryalus" left Plymouth for Australia.
25th (M.) H.M.S. "Mersey" paid off at Chatham.
26th (T.) H.M.S. "Juno" commissioned at Portsmouth for Home Fleet.
27th (W.) Japan requested an early reply to her note from Russia.
" " 56th and 57th Cos. R.G.A. arrived at Mauritius from South Africa in the "Assaye."
" " 68th and 101st Cos. left Mauritius for India in the "Assaye."
28th (Th.) 1st (Royal) Dragoons left England for South Africa in the "Soudan."

FOREIGN PERIODICALS.

NAVAL.

ARGENTINE REPUBLIC. — *Boletin del Centro Naval.* Buenos Aires: November-December, 1903.—"Return of the 'Uruguay' from her Expedition to the Antarctic." "Lecture by Dr. O. Nordenskjöld." "Programme of the French Antarctic Expedition." "Proposed New Regulations for Promotion and Retirement" (*continued*). "The Rio de la Plata and its Harbour on the Atlantic." "Suggestion for a Large Naval Port." "Foreign Naval Notes."

AUSTRIA-HUNGARY. — *Mittheilungen aus dem Gebiete des Seewesens.* No. 2. Pola: February, 1904.—"The English Naval Manœuvres of 1903." "On the Influence of Inward or Outward Turning Screws on the Handiness of Twin-screwed Ships." "The Tactical Value of Ships' Guns" (*concluded*). "Foreign Naval Notes."

BRAZIL.—*Revista Maritima Brazileira.* Rio de Janeiro: November, 1903.—"On Lighthouses." "Blish's Prism for Sextants." "The New German Battle-ship 'Hessen.'" "A Comparative Study of Foreign Navies" (*continued*). "Sea Phenomena." "Foreign Naval Notes."

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Le Moniteur de la Flotte.—Paris: 2nd January, 1904.—"For the Mercantile Marine." "The Naval Estimates." "The 'Vienne.'" "The Arbitration Treaty between France and Italy." 9th January.—"The Russian and Japanese Fleets." "The Navy in 1903." "The Loss of the 'Vienne.'" 16th January.—"Admiral Pottier and the Navy in Crete." "The Navy in Parliament." "The 'Vienne.'" 23rd January.—"The Voyage of the Two New Japanese Cruisers." "Casemates, Turrets, or Cupolas." "The Navy in Parliament." 30th January.—"The Seamen's Savings Bank."

GERMANY.—*Marine Rundschau.* Berlin: February, 1904.—"England and the Command of the Sea in the Mediterranean." "The Latest Phase of Chamberlain's Tariff Policy." "Tingtau as a Bathing Resort." "The Year's Report of the United States Navy, 1902-3." "The Russian and Japanese Naval Strength in the Far East." "Foreign Naval Notes."

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PORTUGAL.—*Revista Portugueza, Colonial e Maritima.* Lisbon: January, 1904.—Has not yet been received.

SPAIN.—*Revista General de Marina.* Madrid: January, 1904.—"The New English Third-Class Cruiser 'Amethyst.'" "The Creation and Development of the Modern Italian Navy." "The Sanitary Service of the Invincible Armada." "Numbers and Assimilation of the Different Grades of the Fleet."

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AUSTRIA-HUNGARY.—*Danzer's Armee Zeitung.* Vienna: 7th January, 1904.—"Spirit and Tradition in the Army." England and the Russo-Japanese Conflict." "The Austrian Landwehr in the Opinion of Foreign Countries." "Our New Turret Battle-Ships and Cruisers." "The Marine Infantry in Naval Service." "The French Railways Under German Management, 1870-71." "Russia's New Strategic Railways." 14th January.—

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RUSSIA.—*Voïénnyi Sbórnik.* St. Petersburg: January, 1904.—Has not been received.

SPAIN.—*Memorial de Ingénieros del Ejercito.* Madrid: December, 1903.—"Armoured Cement: Formula for Calculating the Proportions" (*concluded*). "On the Use of Petroleum as a Combustible on Railways" (*concluded*). "The International Congress of Architecture."

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NOTICES OF BOOKS.

Kriegsgeschichtliche Beispiele aus dem Deutsch-Französischen Kriege von 1870-71. Von Kunz, Major a. D. Dreizehnter Heft, "Der Kampf um den Niederwald in der Schlacht von Wörth am 6ten August, 1870." Berlin: Mittler und Sohn. 1902.

The above-mentioned work forms one of a series of detailed studies of the battle of Woerth, by the same author, who is already well known for his excellent history of the German Cavalry in 1870-71. It has been compiled from the official reports of the fighting sent in by each unit engaged, compared with the official French history of the war now in process of publication, and checked where possible by the direct evidence of survivors; and as the author, unlike Hoenig, Scherff, and others, has no particular axe of his own to grind, it is a model of what such a work should be. The great danger which arises from the superficial study of battles, viewed as a whole, arises from the suppression of the details, of which, after all, the whole is only the sum. One sees only the movements of masses, brigades, divisions, and the like, and, unless special attention is called to some particular point, one is apt to assume that with within these masses everything took place with the same order and precision as on a parade ground, ignoring the human factors which really condition the collective action of the whole; and in time one loses sight of the extraordinary importance of absolute discipline and thoroughness of preparation in all ranks, so that when at last the student is confronted with the hard facts of the battle-field and finds that matters do not move with the rapidity and precision of a field day, he is apt to lose all confidence in accepted principles and to clamour for a return to the methods of primitive barbarism, more particularly when ultimate triumph seems to sanction their employment.

This tendency was as marked in the German Army after 1870 as in our own to-day. The battles of that campaign were mostly fought on the "go-as-you-please" style, and seemed to be successful almost in proportion to the extent to which all superior control disappeared. Results were attributed to independent initiative of subordinates which more correctly should have been credited to the general soundness of the organisation which, foreseeing the inevitable confusion of the battle-field, grouped the forces in such a manner that troops were always at hand to take advantage of opportunities of action as they presented themselves, to redeem the consequences of previous errors in execution of the general design. Victory cancelled all complaints; and no one stopped to inquire how much greater results might have been attained had the original conception been adhered to, and at what a far lower cost in human life.

The battle of Woerth is a special case in point. Viewed as a whole, it was a brilliant victory—and, as a victory, of course worthy of the closest imitation. Analysed in detail, however, it is seen to be essentially a chance encounter, which arose through careless staff management in the intermediate grades on both sides, and only brought to a successful conclusion because the Germans had sufficient men within call to pay the cost of each blunder in succession as soon as it occurred.

With the actual sequence of events on the German right wing the present pamphlet does not deal, and we can afford to neglect them here, for actually the circumstances which arose on their left would probably have brought about the battle quite independently by a natural chain of cause and effect.

As so constantly happens in war, in spite of all regulations to the contrary, both French and Germans, though separated by little more than a mile, were on the night of the 5th-6th August in almost entire ignorance of each other's positions. About 5 a.m. on the 6th a fatigue party was despatched from the French camp to fetch water, and, quite unconscious of danger, took the shortest cut across the fields to the Sauer. The Prussian outposts, seeing a considerable armed party approaching, at once opened fire, to which the French replied. As under the circumstances there was evidently no water to be had, the latter presently broke off the fight and withdrew; but the firing had alarmed the camps all around. General von Schachtmeyer, commanding the Twenty-first Division, with no intention of precipitating an encounter he knew the Army Headquarters desired to avoid, but believing his line of outposts to be too weakly held, took steps to strengthen it; and presently the French saw several battalions moving down to the Sauerbach, and, naturally concluding they were about to be attacked, brought up a couple of batteries and opened fire. As it happened, at this moment the streets of the little village of Spachbach were packed with troops, and the French shells, bursting amongst the roofs of the houses, soon rendered their position very undesirable.

No one, of course, thought of retreating, but merely of getting out of an uncomfortable situation. The officer at the head of the column moved off, the remainder followed, and, there being no cover beyond the village, presently everyone was engaged in crossing the Sauer, everyone apparently believing that though he had no orders himself, the others had, and he could not go wrong in conforming to the general movement.

The mass was now in motion, and henceforward to the end of the battle the troops practically fought it themselves. The appearance of the Prussians on the further bank of the river, of course, drew fresh French fire, and as there was no cover immediately at hand, everyone made for the Niederwald in front of them by the shortest line.

Fortunately for the Prussians, the edges of these copses were very weakly held—only 2,000 rifles for 3,000 yards—and as the attention of the French batteries was entirely taken up by the Prussian artillery, the first rush was almost at once successful, and the wood was entered with very little loss. To make good the position gained, reinforcements were evidently desirable; but now the French were thoroughly aroused, and their bullets hailed down upon the slopes leading to the river and swept the meadows at the foot of the hills beyond it, and under this fire the troops crossing the stream grew impatient and rushed forward without waiting for the whole unit to which they belonged to re-form.

To make matters worse, the mounted officers had all to leave their horses behind them, the banks of the Sauer being quite impracticable, so that the last chance of evolving order beyond the river disappeared, and company commanders and section leaders, only too glad to be off "on their own," raced forward to the desired goal. Presently the whole of the meadows were covered with disordered "trooplets," all struggling forward towards the common and obvious objective—the Niederwald.

For some time the conflict now raged in the interior of the wood, where, in the dense cover, the advantage of superior armament on the French side

was eliminated, and, as fresh troops were poured into the fight, the Prussians forged slowly ahead.

To re-establish the combat, General Lartigne now initiated a counter attack round the southern edge of the wood. Nine companies of the 3rd Turcos, four of the 1st Chasseurs, and four of the 3rd Zouaves dashed forward in a dense line, followed by two battalions of the 5th in line—in all some 3,410 bayonets—and the effect of this, the only united attack delivered by either side throughout the day, was immediate and irresistible. The Prussians everywhere outside the wood gave way and ran back towards the Sauer, not without considerable confusion. But here they were rallied on fresh supports rapidly coming up, and under the flanking fire from the wood itself and a torrent of shell from the Gunstetter heights the impetus of the charge died out, and only a portion of its right wing reached the banks of the stream, and, in places below the mill-dam, where it was easily fordable, succeeded in getting across, only to be shot down by the unshaken infantry now rapidly arriving on the other side. It was about noon when the attack reached its climax and died away.

The Prussians now gathered headway and again re-crossed the river, this time in overwhelming numbers, and the French fell back beyond the spur of the hills running from the Niederwald, past the Albrechtshäuserhof, to Morsbronn. It was the execution of this second attack which appears to have made the greatest impression on the French eye-witnesses. Bonnal, in his book entitled "Froeschwiller" (Paris, 1899), describes the scene in the following words: "Grand fut l'étonnement des officiers français postés au plateau de Lansberg lorsqu'ils virent, vers midi et quart, un noir fourmillement de Prussiens déboucher du pont de Gunstett à la course, avec toutes les apparences du désordre. De cette fourmillière se dégageaient comme par enchantement des colonnes de compagnie allant former, sans hésitation et à une allure rapide, un dispositif très régulier"; and Major Kunz cites the passage as the best proof of the value of the steady drill and discipline of the Prussian drill-grounds. What really did occur he tells in the following words:—

"Though all order had disappeared in the rush down the exposed slope of the hill towards the river, and the subsequent passage across it, once on the other side the men instinctively rallied towards their companies; and though company columns were never re-formed in the sense the French imagined, still as groups the companies fairly maintained their individuality, and went forward by alternate rushes, still fairly in the hands of their leaders."

But he admits that those who thus went on were essentially the bravest; and a considerable number stayed in cover behind—a point not without importance when the next episode of the battle arrived.

In this manner the fighting line reached the Albrechtshäuser-Morsbronn heights, and were settling themselves and reorganising prior to a fresh advance when, about 1.15 p.m., ensued the charge of Michel's Cavalry Brigade. Though initiated from the wrong direction, without artillery preparation, and terribly hampered by the nature of the ground, Major Kunz admits that it fully obtained its immediate object, creating considerable confusion in the Prussian ranks and affording an opportunity to the French infantry, of which they were not slow to take advantage. For whilst the Prussians were still engaged in recovering from their temporary confusion, with their attention riveted to the ground over which the cavalry had ridden, a dense swarm of French infantry, chiefly Turcos, broke in upon their outer flank and rolled the whole line up until the Prussian guns brought the attack to a stand. As practically the last despairing effort of an almost

beaten army, this counter-attack was both brilliant and well-timed, but it lacked cohesion and weight, and though, like the cavalry charge, it gained time—which was all-important to the French at the moment—against the ever-growing moral and numerical supremacy of the Prussians it came too late to turn the scale. Still, as an example of the proper utilisation of the opportunities created by every cavalry charge, it deserves far wider appreciation than it has yet received.

The battle was now virtually over; and in his history of the Prussian Cavalry in 1870 Major Kunz has already told the story of the lost opportunities for a vigorous pursuit. It remains only to summarise the general conclusions of this most interesting work. Most prominent of all stands out the enormous influence everywhere exercised by the appearance of closed bodies capable of controlled fire action. On whichever side the closed battalions were seen, the dispersed skirmishers invariably bolted; and such a movement in retreat once started, its effects spread laterally far beyond view of the disturbing influence. Even within the wood itself the threat of the closed advance conveyed merely by the drums beating the charge—a device several times resorted to in default of real reinforcements—frequently sufficed to induce a retirement; and whenever, either in the wood or out of it, the closed bodies brought their controlled fire to bear, the effect was simply shattering: in a minute a greater loss, both moral and material, was inflicted than in half an hour's individual firing; and if this was the case with the weapons then in use, how much more would it necessarily have been with modern magazine rifles. It does not appear probable that either smokeless powder or increased range accuracy of the weapons would have in any way modified the general course of the fighting: the limit of range was fixed by the ground, which also conditioned the visibility of the targets; and the accuracy of the fire rose and fell with the intensity of the return fire to which the troops were subjected.

It is, however, curious that Major Kunz practically ignores the enormous disadvantage to which the Germans were subjected by the deficient range of their infantry weapons, which compelled them to advance through a fire-swept zone often many hundred yards in width, without the possibility of effective reply; and we would recommend our readers to fight the battle over again on a large-scale map, under the conditions of equal armament on both sides. The results, we can assure them, will be of singular interest; and if the process is repeated with all the other battles of the campaign, we venture to predict that the conclusion will be arrived at that in 1870, as far as tactics are concerned, the British infantry had very little to learn from either French or German. Our present methods, on the other hand, the direct outcome of hasty generalisations on insufficient data from this same campaign, could have led only to repetitions of the pitiable fiasco of the Modder River.

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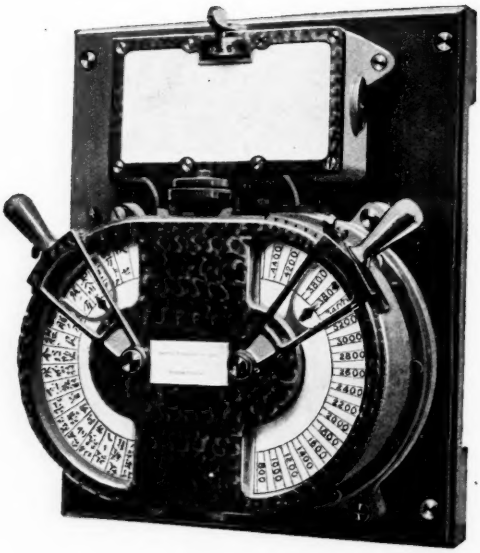

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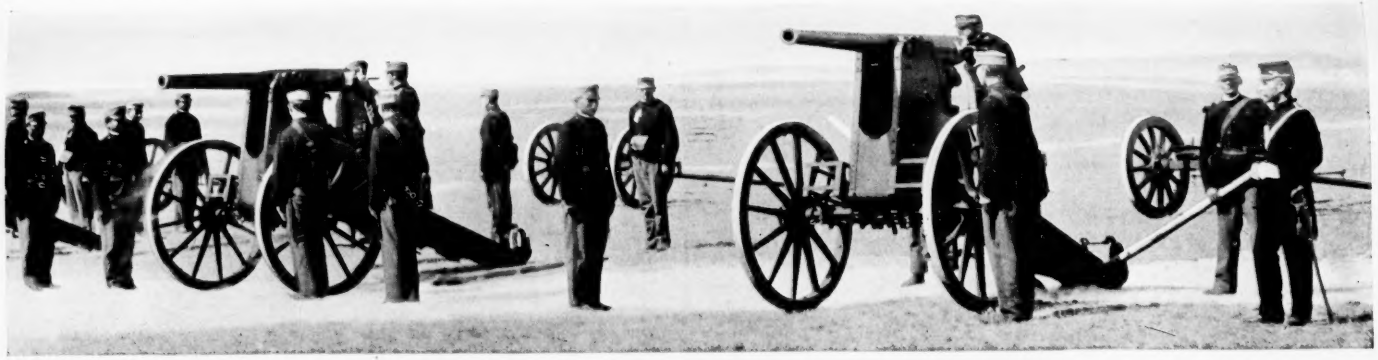

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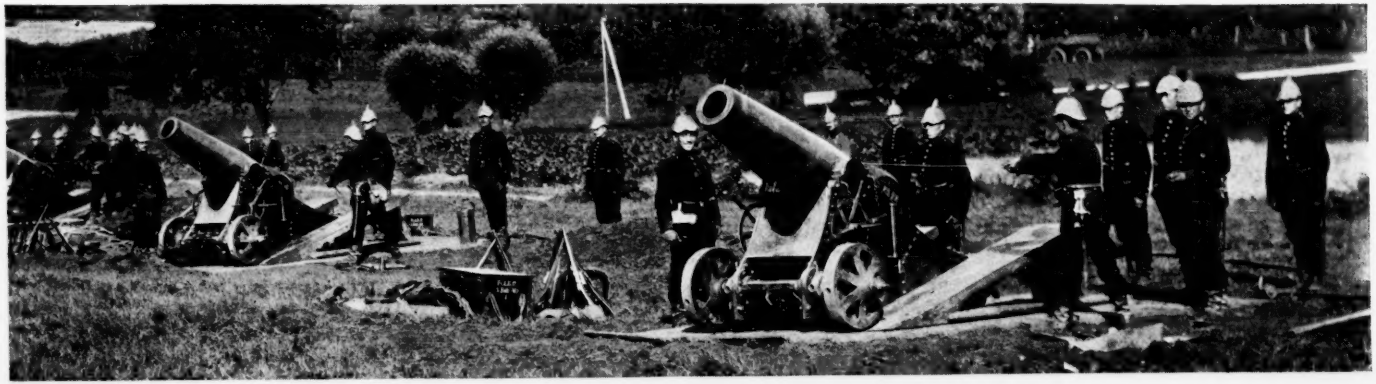

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